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VIADUCTS ON THE AVENUES.

In no American city is the irrepressible conflict between railroads and transverse streets discussed with more interest at this time than in Chicago, where so many important roads center, and all of them at the street level. The rapid growth of the Northwestern Metropolis, enhanced by the very railroads whose lines of travel within the city are becoming a source of annoyance to many citizens, grateful and ungrateful, has completely set at naught the calculations which years ago were supposed adequate to prevent interference for all time between the general public and the railroad public. We say railroad public advisedly, for every man who travels or who ships by any line, the directness or speediness of which is affected by an ordinance of the general public, is one of a number so large as to be worthy of being classed as a special public. In the case of the Chicago, Burlington & Quincy Railroad, whose line across the South Division of the city is at present the point of most immediate interest, every resident on the many suburbs of that line, and a large proportion of those who live anywhere upon its lines, Chicago included, are interested in any measures that facilitate or interrupt communication between the Chicago depot and all others. Those, therefore, who treat the question as if it were one of public *versus* private interest, ignore the true issue, which is one of community *versus* community.

The line of the above railroad passes at surface grade from east to west across the entire breadth of this city, one half mile of the distance being through the thickly peopled South Division, and crossing in that distance Michigan and Wabash Avenues, two of the finest thoroughfares in the country, broad, perfectly straight and level, and handsomely shaded. Besides the passenger travel a large amount of freight belonging to this and other Chicago roads, necessarily crosses these avenues, and, as this traffic increases annually, and the city extends southward in a still more rapid ratio, it has become necessary to take some measures to avoid the increasing danger and detention at these avenue intersections.

The idea of compelling the company to take up their rails and make connection elsewhere is out of the discussion, as the company has the same rights there that any other property owners have, and cannot be legally dispossessed of them though the movements of trains are subject to regulation by law. The expedient proposed, of compelling the railroad company to employ horse-power instead of steam, we may dismiss as only calculated to still further impede travel, as well as those also of compelling the company to run their line entirely below, or twenty feet above grade, as simply impracticable. The railroad company propose to sink their track nine feet, and bridge their line at the avenue intersection nine feet only above grade, leaving the city to approach the bridges by the moderate ascent of one foot in twenty. To this plan there seems to have been but one objection made that is entitled to consideration, and that is the interruption of the *vista* of the avenues.

The accompanying designs are intended to illustrate a plan of "flanking" this objection, by making the viaducts and their approaches outside of the avenue lines, so that the continuity of vision is not interrupted by any change of grade, at the same time that the avenues and the viaducts would be beautified, by the lawns that would thus be formed.

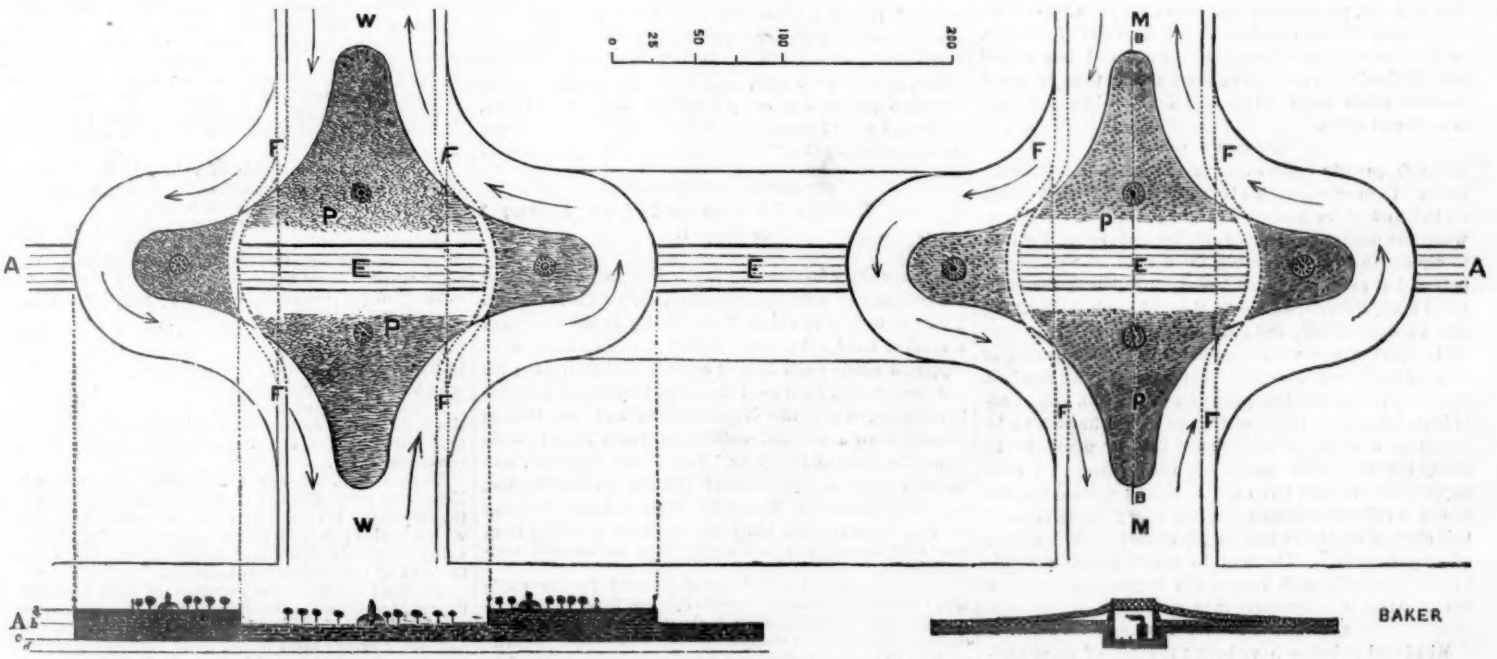
The design contemplates a diversion of the roadway of each avenue, commencing 120 feet from the track, rising very gradually so as to cross the carriage viaducts about a hundred feet back on each side of the avenues, while the side-walks, regarding which the grade is of small account, are carried over the foot viaducts nearly in a direct line.

The triangular space, lying on a level with the present grade and between the diverging paths and the railroad cut, might be thrown into lawn or planted with low shrubbery and flowers so as not to obstruct the view, and also the space at the top of the viaduct between the roadway and foot paths. In the hands of a skillful landscape artist, this plan might be made one of positive beauty, preserving the vista of the avenue, facilitating the travel both of trains and teams, and avoiding all the dangers of collision or fright.

Should it be desired to connect the avenues at the top of the viaduct, the connection could easily be made as indicated by the engravings.

By the curving of the turn-outs a double gain is effected, namely: a more gradual ascent, and an avoidance of a change of grade in front of so many lots. The lots affected by this change, except those actually condemned, would really be helped more than damaged by it. The plan contemplates in each avenue a lawn 260 feet long from north to south, and 145 feet broad from east to west, broken only by the railroad opening which would be scarcely visible, except from an elevation, besides the small plats above, which could be omitted if thought preferable.

The subjoined plan, which seems to us to obviate the objections urged against a direct viaduct, we present for the consideration of both the parties interested, hoping that it may be thoroughly discussed and criticised, and that the result may be the adoption either of it or of some better plan for the purpose.



Transverse Section of the Avenue. *Elevation of the Viaduct.*

PLAN FOR VIADUCTS ON WABASH AND MICHIGAN AVENUES.

REFERENCES.

W, Wabash avenue; *M*, Michigan avenue; *A*, Railroad tracks; *F F*, Crossings for foot passengers; *P P*, Lawns on the avenue level; *b*, Present level of railroad track; *c*, Proposed level of railroad track, depressed 9 feet; *a*, Proposed surface of the viaduct, 9 feet above the level of the avenues; *d*, Lake level, 14 feet below the avenues.

—Advices from Montevideo announce that in the neighboring Argentine Republic the Central Railway from the port of Rosario to the interior city of Cordova, 240 miles in length, and constructed under contract with Messrs. Brassey, Wythes & Wheelwright, had been completed, and was to be formally inaugurated on the 19th of May.

—Texas cattle are now being shipped by the Kansas Pacific Railroad at the rate of about $1,000 per day. The shipments will average 1,500 per day as soon as the fall trade sets in. There are now from 50,000 to 100,000 head in the vicinity of Abilene. The market is quite active.

—On the 9th inst. the first engine for the Omaha & Southwestern Railroad arrived at Omaha. It was built at the Taunton Locomotive Works and named "S. S. Caldwell" in honor of the president of the company.

Contributions.

A CHAPTER ON RAILROAD ACCIDENTS.

BY WM. S. HUNTINGTON.

[CONTINUED FROM THE LAST NUMBER]

It has now been shown that there is a certain class of accidents which cannot be prevented, or that happen in the common course of events, and for which no blame can be rightfully charged to any one. There seems to be a connecting link between this class of accidents which may be said to be unavoidable, and those that are the result of carelessness. The disaster above referred to may be considered of that class, and what has already been said on this class of accidents may be considered sufficient.

AVOIDABLE ACCIDENTS.

Notwithstanding the many and various ways in which a railroad train may come to grief, for which there is no apparent remedy, there are many cases where the ounce of prevention, which is better than a pound of cure, may be applied to good advantage.

On some roads, broken axles seem to be a more prevalent disease than on others, and this is owing, doubtless, to the managers working on the pound of cure plan. That is, they wish to economize, and do so by purchasing cheap axles, which keep them in constant trouble by their frequent failures. The verdict: "Caused by a broken axle," is often rendered of late, and this class of accidents is not diminishing, but continues to be alarmingly frequent. Car wheels have been greatly improved of late, and accidents from broken wheels appear to be less frequent than in the early days of railroading in this country, yet in some instances cracked wheels have been run a little too long and been the cause of damage. A piece broken out of the flange of a wheel has caused mischief, and it is not strange that accidents are frequent on some roads where little attention is paid to defective wheels and axles.

BROKEN RAILS

not unfrequently cause some of the most serious accidents. In most cases, this is the result of carelessness on the part of trackmen. There are cases, however, when the managers are at fault, by not providing iron to replace that which has become dangerous by being so battered as to be weakened. When iron has become battered it requires constant attention to keep it in anything like a safe condition, and the least carelessness or neglect on the part of any one connected with the furnishing of iron or keeping it in repair. It is rare that an accident has occurred by the breaking of a sound rail. Most accidents happen on roads where the iron is known to be unsound, and all such accidents can be avoided. In frosty localities, rails sometimes break when they were supposed to be safe, but even in these localities it is the unsound rails usually that fail, and a large proportion of this class of accidents may be prevented by the exercise of proper caution. The way in which these accidents can be avoided is well known and requires no mention here. All that is necessary is more caution.

RUNNING OFF AT SWITCHES.

Misplaced switches have been the cause of more accidents than any one thing, and, several years ago these accidents were so frequent that timid persons while on a train were in constant fear of becoming victims of some frightful catastrophe in consequence of a misplaced switch. Switches and switch tenders are improving in regard to safety, but we yet frequently hear of some serious accidents at switches. There is a kind of switch, known as Tyler's Safety Switch, much used on many New England roads, that seems to be very efficient and is regarded as sure and safe at all times. This switch was patented, but as the patent has expired any railroad company that wishes to can use it, without fear of prosecution. There is no doubt but that the companies that have used this switch have saved thousands of dollars by it, and it is singular that they have not come into more general use. There are other switches that seem to be all that is desired in the way of safety, but they do not come into general use for some reason; probably because the inventor is poor and wants a trifle for his patent. Running off at switches may in most cases be avoided by the exercise of ordinary care on the part of switchmen and the engineers, and any accident of this kind may generally be charged to carelessness. The list of railway accidents is a long one, and, although a great many on the list are not of a serious nature, yet it is impossible for even a slight accident to occur, without more or less expense to the company, and many times those *slight* accidents are accompanied with the loss of life. Some of the most serious accidents that ever occurred in this country have been at drawbridges, when the cause was clearly traced to neglect on the part of the drawbridge tender, who omitted to change the signal when the draw was open. Accidents of this kind were so frequent a few years ago, and their results of so ruinous a character, that most companies operating roads where drawbridges are used have adopted signals which prevent that class of accidents almost entirely. There are signals so constructed with the machinery of the draw that there can be no mistake as to whether the draw is open or not, and no running off at drawbridges is expected in the future. Probably there will be none, except it be the result of derangement of the signal apparatus and neglect to put it in repair.

In explaining the causes of railroad accidents, perhaps the most comprehensive term would be, the too great desire, on the part of the stockholders and managers, to save money. Here is the *real* great secret of the causes of railroad accidents. And the way in which most of them may be prevented is by a more liberal policy on the part of the managers to supply the necessary material for repairs when they are needed and the exercise of more care on the part of employees.

There is no surer way to prevent accidents than to be always on the look-out for them, not forgetting that they almost always come from a direction where they are not expected. It has become the universal opinion, that traveling by rail is the most dangerous mode of conveyance, but when we consider that there are more persons conveyed by this means than by any other, and yet that there are fewer lives lost by this mode of transportation than by any other, we really cannot find any cause of complaint. There have been occasions where the timid have used their own carriages rather than trust their lives on the cars, and have been either killed or maimed, when the passengers on the train they would have taken have escaped all harm. Accidents *will* sometimes occur, by all conveyances yet invented even when it would seem that all measures have been taken to prevent them. As to railroad accidents, the hints and suggestions in this series, if read with care, and acted upon, may be the means of preventing many a serious disaster. Finally, to close, I would say that all railroad men should work on the principle that "eternal vigilance, is the price of safety."

Railroad Earnings for June, and from January 1 to July 1.

The earnings for June have generally been good, and the comparison with the same month of 1869 is favorable. There is, however, a lack of uniformity in the reports of several of the leading lines, which it might have been supposed would show similar returns in this month; for instance, the St. Paul road shows an important increase in earnings, while the Northwestern and the Illinois Central show a material decline, and Rock Island stands about the same as last year. The North Missouri, and the new roads, as the Central Pacific, Kansas Pacific, and St. Louis & Iron Mountain, all show a large increase over their earnings of last year, naturally resulting from increased mileage, or the completion of through connections.

The earnings of the Union and Central Pacific roads will now be watched with some interest from month to month, as the year which has elapsed since they were opened now allows a comparison with the same months of 1869 to be made, showing what progress is making in their traffic.

EARNINGS FOR JUNE.

	1870.	1869.	Inc.	Dec.
Central Pacific	$632,710	$556,080	$76 630	$....
Chicago & Alton	411,986	402,854	9,133	....
Chicago & Northwestern	1,154,599	1,258,384	....	103,755
Chicago, Rock Island & Pacific	529,512	533,841	5,671	....
Clev., Col., Cin. & Ind'apolis	274,021	259 408	14,613	....
Illinois Central	759,2 4	778,240	....	19,046
Kansas Pacific	344,763	188,417	156,345	....
Marietta & Cincinnati	111,117	118,648	....	7,531
Michigan Central	363,187	366,623	....	3,436
Milwaukee & St. Paul	755,737	678,800	76,937	....
North Missouri	208,492	150,416	58,077	....
Ohio & Mississippi	349 987	223,236	26,754	....
Pacific of Missouri	263,328	249,349	13,979	....
St. Louis, Alton & Terre Haute	150,719	154 132	....	3,413
St. Louis & Iron Mountain	116,249	80,(19	36,233	....
Toledo, Wabash & Western	348,632	348,890	....	258
Total	$6,674,176	$6,337,257	$474,358	$137,439

The first six months of the year 1870 being now complete it is possible to determine with greater certainty what the general condition of railroad business will be for the whole year. By the returns of the last month the total increase in earnings of all the roads since January 1 is $336,919 better than it stood at the end of May, but the progress of the year confirms the general opinion expressed by us at its beginning—that while there might be some increase in traffic in particular cases, it could be hardly expected that railroads would increase their earnings very largely beyond those of 1869, which exceeded any previous year.

For the first six months of the year the net result in the total earnings of the fifteen roads given below is an increase of $1,328,439, or about four per cent. over the first six months of 1869. Allowance must be made, however, for a very considerable increase in mileage, naturally increasing the operating expenses, and adding to the interest account, by expenditure of funds in construction. Prospects for future earnings point to no decided variation from 1869, and the assumption that the last half of the current year will probably equal the last six months of 1869 would seem to be a fair one.

EARNINGS FROM JANUARY 1 TO JULY 1.

	1870.	1869.	Inc.	Dec.
Central Pacific	$2,943,733	$2,432,302	$511,431	$....
Chicago & Alton	2,103,852	2,120,663	....	16,810
Chicago, & Northwestern	5,676,047	6,483 977	....	807,930
Chicago Rock Island & Pac.	2,679,155	2,832,034	....	152,879
Clev. Col. Cin. & Ind	1,444,497	1,373,387	71,110	....
Kansas Pacific	1,583,610	981,702	601,908	....
Illinois Central	4,014,390	3,879,312	135,078	....
Marietta & Cincinnati	617.407	682,948	....	15,541
Michigan Central	2,339,049	2,273,365	....	34,316
Milwaukee & St. Paul	3,(85,564	2,974,246	111,318	....
North Missouri	1,385,482	789,511	595 491	....
Ohio & Mississippi	1,435,273	1,274,189	161,084	....
Pacific of Missouri	1,582,247	1,487,584	94,663	....
St. Louis, Alton & Terre Haute	961,543	919,786	41,757	....
Toledo, Wabash & Western	1,873,166	1,840,541	31,625	....
Total	$33,623,975	$33,295,536	$3351,915	1027,476

—*Commercial and Financial Chronicle.*

Comparative Economy of Iron and Steel Rails.

BY ASHBEL WELCH, C. E.

The unit of value used in the following investigation is that of a mile of rails, without regard to how it is made up of tons per mile or rate per ton.

We shall have occasion to speak of value in each of its three ordinary senses, always distinguishing which; otherwise our results will be conflicting. The greatest difficulty met with in the study of our subject, arose from the ambiguity of this term.

The *intrinsic value* of a mile of rails is measured by their capacity for usefulness, and that, mainly by their endurance; and that depends on their material, size, form and quality. It does not vary, and it does not distinguish between present and future usefulness.

The *exchangeable value* is measured by price, which depends not only on intrinsic value, but on many other things, and varies frequently.

The *economic value*, as we shall call it, is measured by the combined capacity and opportunity for usefulness, that is, the actual usefulness where used, under actual circumstances. It is the value to the user. Future usefulness and future expenses chargeable against it, must be reduced to present equivalents. It may vary by variation of traffic, that is of opportunity for usefulness. It is this kind of value with which we have principally to do. We shall use the word of this sense when not otherwise stated.

An engineer who speaks of value, is likely to mean *intrinsic* value; a merchant, *exchangeable;* a shareholder, or his representative, *economic* value.

Those who have ruined their employers by splendid engineering, have done so because they neglected the distinction between the intrinsic and economic values of their work. They have created capacity for usefulness entirely disproportionate to the opportunity for usefulness.

That is the best engineering which accomplisher the purpose most economically. The present enquiry is therefore a proper one for engineers. They err only who look only at intrinsic values.

A heavy steel rail, laid in a car shed, has four or five times the intrinsic and exchangeable value of a light iron rail; but for use in that place, scarcely any more economic value.

These values, though vividly different, are related. Economic value depends partly on intrinsic, and so in that direction is indirectly related to exchangeable value, which is also partly dependent on intrinsic. Economic value is directly affected by future prices, which control the cost of renewal or replacement.

We shall speak of the duration of rails without distinguishing between the effects of endurance, amount of traffic weight of machinery, or speed of trains. These and other things must be carefully considered in determining the data to be used in the calculations.

Except when otherwise stated, traffic, and therefore values as well as prices, will be considered constant.

The economic value of a short-lived superstructure is most affected by endurance; that of a long lived-one, by interest, on which depends the present values of future quantities. If one mile of rails will last one month, and another ten months, on the same road, and the cost of renewal in each case is equivalent to a total loss of the rails, then, for that road, the latter is worth nearly ten times as much as the former. But if one will last ten years, till money doubles, and the other ten times as long, then the latter, for that road, is not worth quite twice as much as the former.

The present value of the second decade of the lifetime of a rail, is only half that of the first; of the third decade, only a quarter, and of the tenth, less than a five hundredth part that of the first.

On a road where iron rails will last six or eight years, it is therefore of comparatively little consequence whether steel will last half a dozen, or a dozen times as long.

As the value of the rails for a particular road depends not only on their endurance, but also on the amount of traffic they are to carry in some specified time, that is, on their opportunity for usefulness, it is important to estimate correctly, not only what they are able to carry, but what there will be for them to carry. An error in estimate of traffic on any road, is also an error in estimate of value of rails for that road.

It greatly facilitates the comparison of the values of rails, or other things of different duration, with constant traffic or constant tendency to deterioration, to compare both with those that under the same circumstances will last forever. The relations of the destructibles to the indestructible are simpler than their relations to each other.

The practical question has generally been, and often continues to be, not, which is most economical for perpetuation, but whether iron should be used first, while traffic is light and money scarce, and steel dear, and then, when worn out, be replaced by steel.

Let I be the value of a mile of iron, or other inferior or light rails for perpetuation, and J for replacement by some superior rails, that in the place to be provided for will last through the time T; S the value of steel, steel headed, or some superior or heavier rails that will last a longer time T'; and V the value of a mile that under the same circumstances will last forever.

Let L and L' be the losses at the times T and T' respectively for renewals; including rerolling, transportation, relaying, interruptions, repairs and interest thereon up to the time of renewal, risks and all other expenses and inconveniences; and d the decrease in economic value of the superior rails at the time when the inferior are worn out.

Let r be the rate of interest for the unit of time; $a = (1+r)^{T} - 1$ = the rate of accumulated interest for the time T, and a' for the time T'; and a'' the rate for a time equal to T' — T.

Then supposing traffic and cost of renewals constant, $a\,V = a\,I + L$, and $a'\,V = a'\,S + L'$: Hence

$$\text{(I.)} \quad V = I + \frac{L}{a} = S + \frac{L'}{a'}$$

$$\text{(II.)} \quad I = V - \frac{L}{a} = S + \frac{L'}{a'} - \frac{L}{a}$$

$$\text{(III.)} \quad S = V - \frac{L'}{a'} = I + \frac{L}{a} - \frac{L'}{a'}$$

The whole current cost for each unit of time $= r\,V$; which consists of two parts, the interest $r\,I$ or $r\,S$, which is paid as it accrues, and the economic depreciation $\frac{r\,L}{a}$ or $\frac{r\,L'}{a'}$ the payment of which, with the interest on it, is postponed till the rails are worn out.

The whole current cost that accrues during the lifetime of the rails is, $a\,V$ or $a'\,V$, consisting of interest $a\,I$ or $a'\,S$, and losses on renewal L or L'.

The present value of the loss L is $\frac{L}{a+1}$:

(IV.) The present value of L and its successors forever $= \frac{L}{a}$.

The present value of the accumulated interest and loss at the time T is,

(V.) $\frac{a\,I+L}{a+1}$, which is sometimes a convenient measure of the expensiveness of the rail.

The *physical* depreciation and consequent decrease in intrinsic value of a steel rail, when the iron rail is worn out, is,

(VI.) $\frac{T\,L'}{T'}$; but the *economic* depreciation and decrease in economic value, d is

(VII.) $d = \frac{a\,L'}{a'} = a\,v - a\,s$, supposing traffic constant.

If an iron rail will last till money doubles, and a steel rail four times as long, the physical depreciation of the steel, when the iron is worn out, is one-fourth of the cost of the renewal; but the economic depreciation, the decrease in value to the owner, is only one-fifteenth of that cost. For, supposing the present value of the first decade to be 8; that of the second will be 4; of the third 2; and of the fourth 1; and the sum of present values of the first three decades will be 14; that of all four decades only 15; so that the value to the owner, is reduced only one-fifteenth by a reduction of one-fourth of the duration of the rail.

If the loss on renewal is a percentage m on I or m' on S, then

$$\text{(VIII.)} \quad I = \frac{a\,V}{a+m} = \frac{a\,S\,(a'+m')}{a'\,(a+m)} = \frac{a\,S}{a+m} + \frac{a\,m'\,S}{a'\,(a+m)}$$

Steel partly worn, that will still last just as long as new iron, is not necessarily worth the same as new iron, because worn out steel is probably worth more than worn out iron. So partly worn heavy rails that will last just as long as light new rails are worth more, because the worn out heavy are worth more than the worn out light rails.

The value of the partly worn steel is $S - d$, and the current cost for their residuary lifetime is,

(IX.) $a''\,S + L' - (a''+1)\,d$.

If the price p of the iron is not the same as its economic value I, as compared with steel, the advantage or disadvantage of the iron is of course the difference between p and I; and the current cost for the unit of time becomes $r\,p + \frac{r\,L}{a}$.

But p in that case cannot be substituted for I in the foregoing equations.

Any future changes in the prices of rails to be perpetuated are most conveniently provided for by increasing or decreasing the values of L and L'.

In comparing steel with iron to be replaced by steel, it is necessary to take the changes in price into the calculation. Let q be the expected price of steel at the time of replacement; and let b—balance of value of the worn out iron rails over the cost of removal, and of laying down the steel to replace them, together with all the attendant risks, inconveniences and expenses. Then to make iron for replacement equally advantageous with steel

(X.) $J = s + \frac{b+d-q}{a+1}$. Or, if the price of steel is constant,

$$J = \frac{a\,v+b}{a+1} = \frac{a\,s+b+d}{a+1}$$

If the traffic is expected to vary, the time must be cut up into periods co-extensive with the lifetimes of the iron rails, throughout any one of which the traffic must be considered uniform, and the depreciations and values at the end of each period found by the preceding rules.

When the traffic varies, the depreciation in value of the steel has no relation to interest past, but only to future interest. It must be found by comparing the remaining duration of the partly worn steel under the expected circumstances, with that of new steel. Then a'' being the rate of accrued interest for a time equal to the difference between the residuary lifetime of the partly worn steel and new steel, and that of new steel put down at the same time being a', the depreciation of the partly worn steel is

$$\text{(XI.)} \quad d = \frac{L'}{1+a''} - \frac{a''\,L'}{a'\,(1+a'')}.$$

The loss from the value of new steel on renewal being L', that from the value of partly worn steel will be $L' - d$.

When the traffic varies, the value of v varies of course with each change.

Simple and obvious when stated, as the foregoing views and rules are, they were arrived at through calculations much more complex, and sometimes apparently conflicting.

These rules, and the tables deduced from them, do not aid in determining data, nor in any degree supersede experience and sound judgment. But as there are two chances of error, one of judgment and another of calculation, convenient formulæ reduce such chances to one; or at least, diminish the second.

In the following tables some illustrations of the applications of the formulæ, some results and some numbers useful in finding other results are given.

TABLE I.

Quantities frequently represented in the foregoing formulæ. Steel supposed to last eight times as long as Iron. Traffic constant.

T Duration of Iron Rails.	a or a' Rates of accrued interest.....	$L = \frac{4{,}000}{a'}$ Present value of loss on renewals.....	$L' = \frac{5{,}000}{a}$ Present value of loss on renewals.....	T' Corresponding dura'n of Steel Rails.....	$d = \frac{a\,L'}{a'}$ Depreciation of Steel..
1	0.071	56,330	70,425	484	484
2	0.147	27,210	34,013	366	366
3	0.229	17,470	21,837	271	271
4	0.317	12,620	15,775	197	197
5	0.411	9,732	12,165	140	140
6	0.511	7,828	9,785	98	98
7	0.619	6,463	8,077	67	67
8	0.734	5,450	6,812	45	45
9	0.858	4,662	5,827	30	30
10	0.990	4,041	5,051	20	20
11	1.132	3,534	4,417	12	12
12	1.283	3,118	3,897	8	8
14	1.630	2,469	3,086		
16	2.007	1,993	2,491		
18	2.450	1,633	2,041		
20	2.959	1,389	1,736		
24	4.214	949	1,186		
30	6.878	581	726		
32	8.040	497	621		
36	10.90	367	459		
40	14.68	272	340		
42	16.90	235	294		
48	26.18	153	191		
50	30.19	132	165		
54	40.07	100	125		
56	46.13	87	109		
60	61.06	66	82		
64	80.72	50	62		
66	93.77	43	54		
70	122.5	33	41		
72	140.7	28	35		
78	213.1	19	24		
80	244.7	16	20		
88	425.0	9	11		
90	487.9	8	10		
96	737.7	5	6		
100	971.8	4	5		

TABLE 2.

Value of one mile of Rails to be equally economical.
L assumed at 4000, and
L' " " 5000.

T Duration of Iron.....	$I = \frac{V-L}{a}$ I — value of Iron for perpetuation	$J = \frac{a\,v+b}{a+1}$ J — value of Iron for replacement. $b = 1{,}500$	T' Dura'n of Steel.....	S Value of Steel.....	V — value of Indestructible Rails.....
1	—39,528	3449	8	10,000	16,812
2	—14,719	3780	16	10,000	12,491
3	— 6,284	4126	24	10,000	11,186
4	— 1,999	4462	32	10,000	10 631
5	608	4784	40	10,000	10 340
6	2,363	5101	48	10,000	10,191
7	3,647	5409	56	10,000	10,109
8	4,612	5701	64	10,000	10,062
9	5,373	5980	72	10,000	10 035
10	5,979	6241	80	10,000	10,020
11	6,477	6488	88	10,000	10,011
12	6,888	6718	96	10,000	10,006

TABLE 3.

Annual current cost of mile of rails. Rails of equal economy.
Traffic constant.
L = 4000. L' = 5000.

T	T'	r V	r I	$\frac{r\,L}{a}$	r S	$\frac{r\,L'}{a'}$
1	8	1,194	. ..	....	710	484
2	16	887	....	....	710	177
3	24	794	....	....	710	84
4	32	754	....	....	710	44
5	40	734	43	691	710	24
6	48	724	168	356	710	14
7	56	718	259	459	710	8
8	64	714	327	387	710	4
9	72	712	382	330	710	2
10	80	711	425	286	710	1
11	88	710	460	250	710	0
12	96	710	489	221	710	0

TABLE 4.

Comparative economy of Steel Rails and Iron Rails for replacement, taking into account changes in price from 1867 to 1870.

J, value of iron; s, value of steel: q, price of steel when iron replaced; b, value of old rails over expenses; d, depreciation of steel; a, accrued interest; p, price of iron. $J = s + \frac{d+b-q}{a+1}$

In 1867, steel cost..... ...	$15,000	Iron.....	$8,500
In 1868, " "	14,000	"	$7,600, b= 3,500
In 1869, " "	12,000	"	7,600, b= 3,500
In 1870, " "	10,000	"	7,400, b= 3,000
After 1870, " "	9,000	.....	b= 2,500

1867. Dura'n of Iron.	J—value of iron for replacement.	p—J—Advantage of steel.	1869. Dura'n of Iron.	J—value of iron for replacement.	p—J—Advantage of steel.
1	5850	2850	1	5917	1683
2	7912	588	2	6055	945
3	9526	—1026	3	6923	667
4	10213	—1713	4	7213	387
5	10491	—1991	5	7491	109
6	10763	—2263	6	7763	— 163
8	11277	—2777	8	8277	— 677
10	11743	—3343	10	8743	—1143
12	12157	—3657	12	9157	—1557
1868.			1870.		
1	6517	1083	1	4384	3016
2	8219	— 619	2	4655	2745
3	8933	—1333	3	4933	2467
4	9213	—1613	4	5213	2187
5	9491	—1891	5	5491	1909
6	9763	—2163	6	5763	1637
8	10277	—2677	8	6277	1123
10	10743	—3143	10	6743	657
12	11157	—3557	12	7157	243

The values of iron for replacement, in the foregoing table, are different from those in Table 2, Col. 3, for the reason that in the latter the price of steel is considered constant, while in this table it is constantly declining.

In these tables the losses preceding and attendant on renewal of iron rails, are assumed at $4,000. With light rails and not very heavy traffic this is ample to cover all inconveniences With heavy rails and frequent trains to be interrupted, the cost and inconvenience will be much more. The loss on renewal of steel is assumed to be $5,000. That will depend partly on the cost of new steel, and that on import duties, which are not yet settled. We have assumed that it will be $9,000 per mile, which contemplates an advance in duties sufficient to counterbalance the decline in premium on gold. The value of worn out steel is as yet quite uncertain. These, like all other data, must be ascertained for each case, and corrected on new information.

The percentage of difference between $4,000 and any other value of L, will also be the percentage of difference between the numbers in third column of table I., and the numbers deduced from such other value.

It is obvious from inspection of table IV., that iron rails to be replaced by steel have heretofore been found more economical than steel; provided, that those laid in 1867 would last two or three years, those laid in 1868, a year or two, and those in 1869 half a dozen years.

But in 1870 it is equally obvious that steel is more economical than iron that will last even ten or a dozen years.

As a good iron rail will last several times as long as a poor one, and there is no standard of quality, it is impossible to say how much longer steel will last than iron. It will last more than twenty times as long as much of the iron laid during the past ten years. In the tables it is assumed to last eight times as long. On most roads, for reasons already given, this question is of but little importance.

If the cost of renewal or replacement is a fixed sum, then the difference between the volues of iron and steel is also a fixed sum; and there should always be the same difference between the prices. If the cost of renewal is a percentage, the values do and the prices should differ by a percentage.

These formulæ may be used in comparing the ultimate economy of bridges, buildings, vessels, and other things of different cost and durability used for the same purposes.

If single headed rails cost $7,500 and last five years, and double headed, with the chairs they set on, $10,000, and last twice as long, and if the expenses of renewals are $4,000 and $5,000 respectively, then p=7,500. s=10,000. L=4,000. L'=5,000.. a=0.411 and a'=0.99 and (neglecting the cost of revisal and constant cost of wedging the double headed.

$I = S + \frac{L'}{a'} - \frac{L}{a} = 10{,}000 + \frac{5{,}000}{0{\cdot}99} - \frac{4{,}000}{0{\cdot}411} = 10{,}000 + 5{,}051 - 9{,}732 = 5{,}319$ So that the double headed has the advantage of $p - I = 7{,}500 - 5{,}319 = 2{,}181$ over the single headed for perpetuation.

Suppose that a wooden bridge will cost $10,000, and last sixteen years; and that the repairs, insurance watching, and all expenses on it, with the interest on those expenses up to the time of renewal, and the cost of removal and the inconveniences, all together, amount to $5,000, over the value of the old materials; and that a permanent bridge can then be built at the same cost as at first. Then $I = 10{,}000 + 5{,}000 = 15{,}000$, and $a = 2$. Substituting these in the equation $V = I + \frac{L}{a}$, we have $10{,}000 + \frac{15{,}000}{2} = 12{,}500$, equal to the value of a bridge that will last forever.

When the business is very heavy, the inconvenience of renewals, and the risks from fire or accident of temporary structures, are of course controlling considerations. If the interruption caused by the burning of the wooden bridge would involve a loss of $50,000, and the annual chance of burning is one in a hundred, then the annual risk of $500 capitalized, adds $7,042 to the difference between the values, making that of the indestructible bridge $24,542.

As traffic generally increases faster than is expected, (though profits do not) steel rails and permanent structures become more advantageous than the calculations. They also have the advantage of safely allowing increased weights and speeds, which may become important.

On the other hand, where safety is not involved, and

interruption would not cause serious loss, and especially (as happens so often in this country) changes of route or plan are liable to be made, and where calculation makes the ultimate economy nearly equal, it is best to adopt the cheaper rail or structure. This is especially the case in station buildings and shops. Dead capital and outlay for a future generation better able to help itself than we are to help it, are thus avoided.

Our calculations are made on interest at 7 per cent., compounded semi-annually. Few railroad companies borrow at lower rates, many at much higher. Of course the calculations for each road must be based on the actual rate.

The writer having had much occasion to deal with these questions, has arranged the foregoing rules and tables for his own convenience. He presents them for publication, hoping they may sometimes abridge the labor of others who have to deal with the same questions.

Comparisons such as that of the ultimate economy of the wooden and stone bridges are often judged of in this country, though perhaps not often formally made. But an eminent European engineer told the writer, some years ago, that the idea of such a comparison was entirely new to him.—*Journal of the Franklin Institute.*

Durability of Iron.

The very recent lamentable catastrophe on the Great Northern Railway leads the mind to reflect very seriously upon the important subject of the durability of iron when exposed to constant and severe service. Without entering upon the recondite and abstract question respecting the assumed change that is supposed to occur in the molecular arrangement of the material when subjected to continual strains, common sense tells us that the result of wear and tear is the same in everything: and whether the object be a rail, an axle, a wheel tire, or human being, deterioration is the inevitable consequence of exposure to wear and tear. Of all materials belonging to the art of construction iron, whether cast or wrought, is that which shows least superficially the actual condition of its internal structure. It is a simple matter to detect the incipient signs of impending failure in timber, brick, and stone, either in the mass or in detail, but the case is far otherwise where iron is concerned. Moreover, that material has been, comparatively speaking, so recently introduced upon a large scale into the art of construction that literally there has not yet been time enough to form even an approximate judgment of the period of its durability. This period will naturally depend upon the nature of the service to which it is subjected. *Prima facie*, a wheel of a locomotive in constant service, and the parts revolving with it, certainly appear to undergo the maximum amount of wear and tear that could fall to the lot of any moving body of a similar description. It has really no rest, for when not in motion it has to carry the weight placed upon it. Motion and deterioration are synonymous terms, for the former is the inevitable precursor of friction, which is the destroying angel of all terrestrial objects. Had the necessity of friction as one of the laws of nature been properly recognized by those who sought after "perpetual motion," the lives and fortunes of many clever and ingenious men would not have been lost in the manner they have been. Without taking into account the question of motion, the subject of the effect of a long-continued pressure or strain upon a bar or beam of iron may be regarded in a purely statical sense. In plain language, suppose, for sake of example, an upright pillar loaded with a weight duly and safely proportioned to its ultimate breaking weight—will the pillar carry this load *ad infinitum?* It is of course taken for granted that no disturbing agent arises to interfere with the assumed statical state of affairs.

Some valuable experiments were undertaken many years ago by Sir W. Fairbairn, with a view to obtain a practical solution of the problem. It cannot be said that the results arrived at by him were strictly conclusive, but nevertheless they are extremely interesting and instructive, and furnish the best existing data respecting the matter. One of the first results of these experiments was to upset the theory held by previous writers on the transverse strength of materials. They considered, and, in fact, asserted, that the resistance of cast iron was restricted to the limits of the strain which would produce a permanent set. Upon this hypothesis it would not be safe to load the material with a weight greater than one-third of that which would cause its fracture. It is questionable if it would be judicious to load cast iron as a rule in practice to a third of its breaking weight even with a statical load, although in the experiments referred to some of the bars were loaded to within a tenth of the weight that would break them. In all experiments of this character it must be borne in mind that is impossible, in spite of every care, to assimilate the conditions precisely to those which prevail in actual practice. A very close approximation may often be obtained, but an exact identity is impracticable. The difficulty that arises in subjecting bars of cast or wrought iron to a long-continued statical load is to ensure a complete absence of any vibration, for if this element be allowed to be introduced into the experiment the result is at once vitiated, and the case becomes altered to a dynamical instead of a statical force. The vibration of the floor or platform upon which the tests are carried on is quite sufficient to affect the results in this manner. It thus was impossible in some of the experiments under consideration, to determine whether the fracture of some of the bars was brought about by the direct statical pressure, or whether it occurred in consequence of any sudden vibration being imparted to the whole arrangement. The effect of any long-continued pressure or repeated strain of any kind upon any material will obviously be to weaken the cohesive force, and thus gradually destroy the resisting capabilities of the body.

In those instances in which a bar is tested *a l'outrance*, its resistance is readily appreciable by the deflection. Evidently the greater the load the greater the deflection. But it was demonstrated by the bars submitted to test by Sir William Fairbairn that with a constant weight time produced the same result that a gradually increasing load would have done immediately. Thus with a given load one of the bars broke at once, while another of the same dimensions bore the same load for more than thirty days. Unfortunately it was not determined whether this last fracture was the result of accident or vibration. It is impossible, having a proper regard to these facts, to prevent arriving at the conclusion that time and a constant exposure to strains and loads must in the long run very materially contribute towards the deteriorating and literal wearing out of the material. The effect for a short time may be completely imperceptible and impossible of detection by the most refined agents of skill and analysis. But nevertheless the evil does progress. Insidious and slow in its first advances, it is not the less sure in its final accomplishment, and that which at the commencement was barely perceptible becomes at last but too forcibly prominent. If we suppose the flaw that was discovered in the broken axle of the wagon in the accident to which we allude to have been the final climax of the successive jerks and violent strains to which it was subjected during its myriad revolutions, a little calculation will demonstrate how imperceptible must have been its gradual culmination. We cssume that directly the wagon was started running the cause of ultimate destruction commenced to work. According to the evidence given at the inquest this wagon had been in active service for the last eighteen years. No record was kept of the number of miles it must have traveled during that time, but it was estimated that about 230 miles per week was a fair average for the distance run by the ordinary goods trucks and wagons. The diameter of the wheel may be taken at 2 feet 6 inches. If the calculation be made upon this data it will be found that this axle made the astounding number of 144,668,160 revolutions during its life time. Supposing, for the moment, that the destroying agent did not commence until some time after the wagon had commenced running, yet who can possibly tell when it did begin? It is much more rational to regard the flaw as the result of a successful repetition of the same cause than to suppose that it arose from a sudden and single one. The opinion was expressed at the inquest that the flaw must have existed about six months prior to the fracture of the axle, but this was merely an opinion and it would be impossible to prove the date of its first existence. Our information upon this particular subject is very scanty. It may be said to be a *nil*. It would be very desirable to know what part the volocity, that is, the number of revolutions in a given time, plays in the matter. If it be assumed that after a time the axle will be destroyed independently of the velocity, then the problem is solved. But putting V for the velocity and N for the time or total number of revolutions, then the life of the axle is evidently proportional to $N \times V$, and for the same sized axle made of the same metal the equation $N \times V$ should be a constant. The state of the road run over would also seriously affect the result, and in fact so many other agencies and contingencies would spring up that the accurate solution of the question would not be practicable. The conclusion to be arrived at from a consideration of the facts points unmistakably to the observation made by the inspecting officer of the Board of Trade, Captain Tyler. He remarked that some better register should be kept of the mileage run by the wagons and carriages of the trains, so that there might be some idea of the period at which a wheel or an axle might be fairly presumed to be nearly *hors du combat*. At these stages a more stringent and careful examination of them should be made, and thus a more precise knowledge of their condition would be obtained than that which is arrived at through the medium of the eye and the car.—*Mechanics' Magazine.*

A Railroad Accident in England.

Never does a journalist feel his task so painful and irksome as when he is called upon to review a disaster which entails the destruction of human life and health. With the terrible catastrophe of Abergele yet fresh in our memories, it devolves on us to notice another almost as lamentable. The late disaster on the Great Northern Railway, unlike that in Wales, is terribly simple, so totally unforseen as to have a very humiliating effect on the minds of engineers. The facts can hardly be more simple. An excursion train from London, consisting of four sections, one destined for each of the principal towns of Yorkshire, meets an up goods train at about three-quarters of a mile from Newark. Just immediately before the two trains meet the axle of one of the wagons in the goods train breaks across, and after that wagon has jolted and stumbled some score or two of yards it throws seven wagons that are behind it across the down line, and the "six-foot" but a few seconds before the excursion arrives there, and almost in a second several of the hapless travelers, some asleep, some chatting over their day's pleasuring, are plunged into a scene of death and disablement.

From the evidence given before the coroner it is incontestably proved that none of the officials in charge of either train were in any way to blame. It has been proved that the driver of the goods train had scarcely discovered the nature of the mishap to his own train before the excursion train was wrecked upon it. From all the evidence, and especially from Captain Tyler's, as well as that given by him before the coroner as that embodied in his elaborate report to the Board of Trade, we have little room to doubt that the primary cause of the catastrophe was the fracture of an axle of one of the goods wagons. There is no evidence to justify us in supposing that any part of the train had left the rails until after the axle had given way. Captain Tyler's description of the manner in which the ground and the sleepers were marked and torn for some distance in the rear of the goods train indicates the action of the unsupported end of the broken axle before it had broken away from the axle box at the other end and fouled the trailing axle.

The question presenting itself for our consideration as engineers is, How, if sound immediately before, the axle could so suddenly give way? or how, having an extensive flaw in it at the point of fracture, that axle came to be there at all? There are three ways by which an axle may fail: the first would be from bad material, the second from flaws, the third from what we may call "fatigue." From the extreme care exercised by railway companies the use of bad material in their own rolling stock is reduced to a minimum; we say their own rolling stock because we have more to say about that presently. The presence of flaws can be detected with tolerable though not with absolute certainty by close scrutiny and by "ringing with a hammer." If the flaws are external, too, they may be detected by scratching the surface of the axle carefully with a steel instrument, though this is uncertain as a test, because the inequality revealed by this may be entirely superficial. It is easier to test axles in the workshops and without their wheels than after they are mounted and fitted to the wagon; easier, whether the test be by sight or by sound. There are better facilities for examining them visually, and as to the "hammer" test it is a very different thing to sling a plain axle and "ring it," and to "ring it" when it has a pair of heavy wheels on it, and is supporting a matter of five or six tons; besides, the wheel strikers could not, even if they wished, strike the axle itself under these conditions without getting beneath the wagon for the purpose. All they strike is the wheel, and they very properly do not trust to the sound of one of a pair of wheels; they test them individually, and if so, it will be fair to assume that striking either wheel will not go far, though it may help a little to test the axle. The question of fatigue leads us to some of the evidence adduced before the coroner. We find Mr. Sacre stating that the wheels of the wagon which broke down were in use 18 years. We must only assume that the axle in question was the same age, though we have no positive statement to that effect. The only way in which long-continued work tells on the durability of an axle, apart from the wear of the journals, is by the change the iron itself undergoes. From the day it is put to work till it breaks or is thrown to scrap it is passing from a fibrous to a crystalline texture; or, to give our non-professional readers a better idea of the change, when new an axle should in a measure resemble whalebone, and when it had lost its crystallisation it would be of the nature of sealing wax. An axle, shaft, or the like, which is subject to violent vibration in work, becomes crystalline very rapidly. Indeed, all iron, even when left to itself, by slow degrees passes from the fibrous to the crystalline state, and the only method of restoring the fibrous texture is by the process of annealing, which is simply to heat it to a bright red and allow it to cool slowly, the degree to which the iron becomes fibrous depending in a great measure on the temperature within or up to the red heat that it is brought to, and the time allowed to elapse before it becomes cold again. If it were cooled instantly in water the texture would, even if fibrous before, become at ence crystalline. This question of annealing brings us to the evidence of its use as a test, as given before the coroner. We confess ourselves we cannot see how it could serve to reveal a hidden flaw save by the principle of burning of all extraneous matter from the surface, and even then the axle would oxodise in cooling, and once again conceal the crack.

From the evidence before us it is clear that the detection of the flaw which caused the disaster was wholly impossible without removing the wheel, and even after that we believe the place would have to be skinned a little in the lathe to discover it. There is one point in Mr. Sacre's evidence which at once arrests the attention of a mechanical engineer; it is the following statement: He says, "The broken axle is 3½ inches diameter at the centre, up to the boss 4¼ inches, inside the boss or through the wheels 3 15-16 inches." Immediately after, he says, "The shoulder of the broken axle is turned square, as far I can tell from close inspection." We believe this statement, coupled with other evidence, makes the nature of the failure clear, but we confess to a feeling of both surprise and sorrow to hear such a statement. The axle in the boss of the wheel is more than half an inch less than that part immediately behind the wheel, or a quarter of an inch of shoulder. Well, that is as little as could well be allowed in forging an axle for "machining," a place for the wheel boss, and to cut out any mark or superficial defect, but we must ask the question, How was it that shoulder had a sharp corner instead of being as—if the foreman who had charge of the turning of the axle in the lathe knew his business it would have been—rounded well off to a radius of the depth of the shoulder at least? We would have it more than this. The fact that the shoulders are frequently made square only shows how extensive is a bad practice. Every competent mechanic knows that turning corners of journals or bearings of any kind sharp makes the shaft at that point quite ten per cent. weaker than if the shoulder is well rounded off. This very accident proves the truth of the matter. Here, as Captain Tyler tells us, is a flaw surrounding the axle at the fracture; we are told the fracture is at the wheel boss, and Mr. Sacre tells us that he had to scrutinize the axle closely to determine if the shoulder was turned square. That proves pretty clearly that the axle broke just as one with a sharp corner might be expected to do—straight across at the corner. The fact of the flaw all round the circumference testifies at once to the evil of sharp corners, and to the excellent quality of the axle in standing so long.

The details of the failure as to place, etc., appear to be quite natural. The train had just rounded a sharp curve—we are not told definitely whether the wheel at the fractured end of the axle was on the outside or the inside of the curve. We suspect on the outside. It was the leading wheel, and consequently got most of the grind and strain of the flange of the wheel, and this acting on an axle in which a flaw already existed—a flaw, we consider, induced in the axle by the square-cornered wheel bearing. Every fact hangs together in support of

our theory, the remarkable nature of the flaw; one we can tell in almost the same plane as the shoulder throughout, because if not, some little "tag" would have enabled Mr. Sacre to determine, without close inspection, whether the shoulders were round or not. This, then, acted on by the strain of the wheel rubbing round the curve, and that strain acting at the flaw with all the leverage of the radius of the wheel, the only wonder is that the axle did not fail months before. The existence of the flaw at that particular place could not by any possibility have been detected by sight, unless the wheel had been removed, and as we have already stated it was unlikely to be discovered by striking the wheel. That, indeed, is no matter of theory, because we are told the wheels were sounded scarce an hour before.

The fracture raises a somewhat curious point in the durability of axles—that is, the formation and growth of a flaw in one. We are told in the evidence that some axles last twenty while others give out at five years, but the reason assigned for throwing an axle to scrap from old age is on account of the wearing of the journal, and not from the creation and growth of flaws; indeed, except under peculiar circumstances, we don't believe in any iron or steel axle, originally sound and homogneous, failing by gradual cracking, nor can we call to mind any example of such a thing. But then, on the other hand, if the flaw in this axle existed originally, it would probably have been detected in the lathe.

Before concluding, we must touch on two points; the one is, that we consider Captain Tyler's remark about the importance of a complete register being kept of all rolling stock, a perfect history, in fact, of each vehicle and its leading parts, is an excellent one. The second point we referred to at the commencement of this article, and it is the difference between the rolling stock of the company themselves and that of private firms or of individuals. We should certainly like to know the provisions made by railway companies to secure that private rolling stock is as carefully constructed and repaired as their own.—*Mechanics' Magazine.*

The Friction of Steam Engines.

If we did not believe that it is easy to say something new on a subject which has been in a very peculiar sense worn threadbare by the inventors of cylinder lubricators and steam greasers, this article would never have been written. So far as we are aware, all the information regarding the resistance of steam engines due to friction is to be found in the circulars of inventors, one or two papers read before the engineering societies by the advocates of particular methods of lubricating engines, certain theoretical disquisitions contained in text-books of mechanical science, and perhaps a report or two in the *Journal of the Royal Agricultural Society.* It is almost needless to say that the subject is one of very considerable importance; but it may be worth while to bring this importance home in a tangible form to the employer of steam power. It may be stated, in pursuance of this object, that it by no means follows that an engine giving a very high indicated duty per pound of coal is really the most economical that a manufacturer can use, for the simple reason that the power required merely to drive the engine may be so great as to render the saving in fuel valueless. A case in point suggests itself. An experiment was made some time since with a compound engine, the general particulars of which are before us. This engine was of the annular type; the large cylinder about 35 inches diameter, the inner cylinder about 15 inches; the stroke of both pistons was the same, about 5 feet, the piston rods both laying hold of the same cross-head, which was connected with an overhead beam. The experiment consisted in shutting the steam off from the inner cylinder and driving with the outer annular piston alone. It was found that the engine, then indicating the same horse power as before, failed to drive the machinery at the proper speed; and it was not till the indicated horse-power was augmented nearly forty per cent. that the engine would do the work. On permitting the steam to find its way to the inner cylinder as before, the indicated horse-power fell to the original point, the machinery being driven at the proper speed. We shall not pretend to explain why this was the case. It is indeed difficult to understand why the fact that the inner cylinder, though open to the atmosphere, took no steam, should so enormously reduce the effective power of the engine. The facts are as we have broadly stated them, and there is no reason to think they would now want explanation if engineers had in times past devoted a little attention to the study of the phenomena of friction in the steam engine. We have no doubt whatever that many so called economical engines are doing very bad work indeed; nor that many so called wasteful engines, as far as coal is concerned, are giving out a far higher duty than is generally believed. The entire subject is wrapped up in mist—a mist which can be dispelled only by careful experiments, extending over long periods, and properly and fairly analyzed. That a few engineers have conducted experiments on the friction of steam engines and other machines is certain; but it remains to accumulate in a single volume the statistics which these gentlemen possess, and to put them into a form which may render them generally useful. But these data have at all events done this much—they have satisfied us that ordinary theories regarding friction in steam engines based on investigations concerning the co-efficients of friction between lubricated surfaces, apply most irregularly and imperfectly. In other words, there is no theory at present in existence which will enable us even approximately to predicate with certainty what the loss of effect by friction in any given engine may be. In certain cases, calculations made with this object will correspond, with surprising exactitude, with the results obtained through the indicator and dynamometer. But the engineer resting ratisfied with such occasional coincidences is mistaken in his views. In scores of other instances, enormous discrepancies will be found to exist between theory and practice—the almost total absence of frictional resistance in some engines contrasting strangely with the expenditure of power absolutely wasted in others. It is not the mere loss of fuel alone—although this is bad enough—that has to be considered in dealing with this subject. We find engines unable to do their work overloaded and worn out; boilers burned and overtaxed; grease and oil wasted; indeed, we go so far as to hold that every horse-power unnecessarily spent in overcoming the frictional resistance of a steam engine costs three times as much as if it were spent in doing useful work, and this without taking at all into account the fact that useful work returns money, while what we may call the internal work of the steam engine returns none.

The difficulties which lie in the way of ascertaining by actual experiment what the frictional resistance of an engine is are very great, and to this cause no doubt is to be attributed the greater portion of the existing ignorance of the subject. The obstacles in the way are of two kinds. In the first place, it is very difficult to put a dynanometer or brake on large engines whereby to ascertain their duty; and, in the second place, the amount of friction varies not only in different engines, but in the same engines in a very extraordinary way. As regards the first difficulty, we can, in the case of pumping engines, ascertain precisely how many foot-pounds of work an engine actually gives out in the shape of useful effect while the indicator shows the work done on the piston; but from these data it is impossible to calculate engine friction exactly, because our calculations are complicated by the greater or less efficiency of the pumps. It is possible that nothing can be more deceptive than the results obtained from pumping engines, and therefore we have no hesitation in rejecting their aid in dealing with questions of engine friction. Practically speaking, the only generally available test is the indicator used with the engine light and the engine loaded; but diagrams taken thus do not account for the extra friction due to the performance of the work, though useful to some extent in their way; but no investigation of the qualities of an engine can be regarded as complete unless the dynanometer is used as well as the indicator.

As regards the variation in the loss by friction in the steam engine, a very great deal might be said which we shall not attempt to say now. It may induce others to experiment for themselves, however, if we place a few facts curiously illustrative of the peculiar phenomena of engine friction before our readers. In one case we conducted the experiment personally; for the results of the other we were indebted to a gentleman who, in superintending the replacement of ordinary boilers by the now well-known Howard boiler, has occasion to indicate a very large number of engines and on whose accuracy we can rely with certainty. In the first experiment which we shall cite we found the full power exerted by a rolling mill engine in the north of England—where, it it is unnecessary to specify—to be 291.5 horse. This included the resistance due to a fly weighing thirty tons, a bar mill with two pairs of rolls working on heavy orders and the reqisite gearing. Engine and mill empty required, according to one set of diagrams, 74.8 horse-power to run them at the working speed: but according to another set of diagrams, the frictional, resistance of engine and mill is less than 35 horse-power, and all the diagrams were taken within a few hours. We cite this case only to illustrate the difficulties engineers have to contend with in endeavoring to estimate the friction of engines under ordinary circumstances.

The other experiment is very interesting and curious as regards results. The engine was a double-cylinder traction engine, built by Messrs. Howard, of Bedford. The cylinders are 8 inches diameter and 12¾ inches stroke. The engine-shaft can be disconnected from all the rest of the machinery, so that the whole work done by the steam consists in turning the crank-shaft and overcoming the friction of the bearings, pistons, etc. With 60 pounds of steam in the boiler, the engine, making 190 revolutions, indicated unloaded 2.64 horse-power. The engine was then set to drive a brake loaded to 16 horse-power, the link being put in full gear; under these conditions the engine indicated 22.55 horse-power. The frictional resistance was therefore increased by the fact that the engine was now doing work, to 6.55 horse-power, or nearly three times that of the unloaded engine. This is all plain sailing, but now comes a most remarkable fact. The throttle valve was thrown full open, or nearly so, and the engineers linked up—that is, worked expansively at the same velocity, 190 revolutions per minute. The load on the brake, etc., remaining absolutely unaltered, any engineer would predict that, under these circumstances, the result would be the same; far from this being the case, however, it was now found that the effective work or duty of the engine being unaltered, the indicated power *was only* 19.86 *horse-power*, so that the friction of the engine when linked up was only 3.86 horse-power, or little more than one-half that of the engine working in full gear. Lest there should be any mistake about this, the brake was then loaded with 504 lbs. With the link in full gear the engine indicated 44.88 horse-power; the link was then put in the first notch, and the throttle-valve fully opened, everything else remaining unchanged, when the power fell to 40.92 horse, the frictional or internal engine in the latter case thus being 3.86 horse-power less than in the immediately preceding experiment. How are these facts to be accounted for? Is it that the varying strain on moving surfaces in contact, due to the action of expanding steam, is attended with less frictional resistance than is present when the metals are under the steadier strain of non-expanding steam? We shall not pretend to answer these questions. There are the facts for the consideration of those interested.

Is it too much to hope that engineers who have the opportunity will take up this subject, and endeavor to throw light into what is at present a very dark and unexplored region of mechanical engineering? We are convinced that the results would, when time and perseverance had multipled data, be found of very great value to those who desire to see the steam engine undergo the real improvement of which it is still capable. We venture to suggest that the general practice of indicating the engines tested by the Royal Agricultural Society while running against the brake, and the publication of those diagrams, would be productive of much good.—*The Engineer.*

A Treasonable Railroad Gauge.

The Washington correspondent of the Cincinnati *Gazette* writes the following:

Senator Drake has originated a new argument against a railroad, if it happen to be in a Southern State. The nation should be thankful for new arguments, since the old ones have mostly failed. In the proposition to fix the gauge for the Southern Pacific road at five feet, Mr. Drake saw the terrible features of a civil war, and gave utterance to the following warning:

"The building of the roads of the South with a uniform five-feet gauge was a part of the scheme of the rebellion, and was intended to prevent the cars and locomotives of the Northern roads from going into that country when the war should break out, which the Southern men said they would bring upon us."

Mr. Drake gave as his authority for the statement: "An officer high in command in the Union army, who got his information during the war of the rebellion:" and this Union General had it from a "leading railroad man of the South." And so, if the railroad man told the Union General the truth, and he in turn repeated it correctly to Senator Drake, the latter, if he stated it as he received it to the Senate, has a novel argument against Pacific railroads with five-feet gauge.

As Mr. Drake keeps his eye closely upon the Constitution, an amendment somewhat like the following may be expected:

"Treason against the United States shall consist only in levying war against them, giving aid and comfort to their enemies, and building railroads with a gauge of five feet."

Central Railroad of New Jersey.

The following circular to the stockholders, has been issued by the President, John Taylor Johnston, dated July 6:

A semi-annual dividend of four per cent. has been declared payable on the 20th instant.

During the absence of the President in Europe, no reports have been made to you for the years 1868 and 1869. They have now been prepared, and will be received from the printer about the 1st proximo, when they can be had on application to Samuel Knox, Treasurer.

The following is a short summary of the results of the business of the two years, as also of the six months of the present year, June being partially estimated:

	Year 1868.	Year 1869.	Six months 1870.
Gross earnings	$3,729,412 56	$4,010 121 73	$2,169,360 54
Expenses	2,379 192 70	1,642,163 37	1,162,388 21
Net earnings	1,350,219 86	1,367,958 36	1,006,972 33

The net earnings and other items carried to the credit of profit and loss, were appropriated as follows:

	Year 1868.	Year 1869.	Six Months 1870.
Interest	$145,518 34	$508,481 74	$166,846 30
Taxes	194,225 83	67,506 23	79,486 13
Dividends	1,390,165 00	.....	600,000 00
Reduction of equipment accounts, &c.	340,647 16	858,530 61	.....
Surplus over dividend			168,137 90

The assistance of the renewal fund was required to pay the dividends of 1868. In 1869, though the accounts showed a surplus of $858,530.61, no dividends were made. The large purchases of engines and cars required by the general business, and also the unexpectedly large advances required for the Newark & New York Railroad had created a floating debt. The money was all spent, and it was deemed judicious by the board to suspend dividends and pay off the debt.

The company is now again free from debt and prepared to resume the regular division of whatever profits may be realized from the business. The actual net profits of the six months were over five per cent.

—In a recent case before the Supreme Court of Missouri, damages were claimed for injuries to animals which were on the track through the company's failure to fence as required by law, and were injured by jumping from the track when frightened by a train, but not by contact with the train itself. The Court decided that the railroad company was not responsible for such injuries, saying: "In construing the statute we must "examine the whole object which led to its enactment. "The words are that the company shall be 'liable in "double the amount of all the damages which shall be "done by its agents, engines or cars, to horses, cattle, "mules or other animals on said road.' It seems to me "plain that a direct or actual collision was contemplated; "that where the agents of the road ran the locomotives "or cars against any animal, and thereby injured it, or "in any other manner it was hurt by actual contact or "touch, then the company should be responsible for the "penalty; otherwise not."

—A telegram from Quincy dated the 14th inst. says that a careful investigation into the cause of the recent railroad accident at Fowler Station, on the Chicago, Burlington & Quincy Railroad, shows that the conductor of the freight train violated his positive instructions in running on the passenger train's time, without first giving the conductor a written notice to that effect.

Great Western of Canada.

The following circular respecting the loop line from Glencoe to Buffalo, called the Canada Air Line Railway, issued by the directors—previous to the meeting of July 6th, at which it was determined to construct the line at once, explains why the work is undertaken at this time:

"Since the issue of the shareholders of the half-year's report in March last, events in Canada have been so rapidly developed, that, with a view of preserving the property of the Great Western Railway, a special meeting of the proprietors has been called in London for Wednesday, July 6th, 1870 (being the earliest time the requisite notice permitted), in order to consider the necessity of constructing the 'Canada Air Line Railway,' which is a loop line of 146 miles from Glencoe to the city of Buffalo, and thus counteract the measures adopted to construct a rival railway intended to occupy the same district. It has been already announced to the shareholders that legislative power had been obtained at the close of last year to construct this loop line, and a survey has been made. The road will leave Glencoe, a station on the Great Western main line 80 miles from the Western terminus, and will proceed, with but little deviation from a straight line, to Fort Erie, on the Niagara river, directly opposite to the city of Buffalo, an unbroken connection with the various American railroads centering in that city being made by the International bridge, now in course of construction. The Act authorizing the loop line confers running powers over 44 miles of the Buffalo & Lake Huron branch of the Grand Trunk Railway from a station called Canfield to Fort Erie, if terms can be agreed upon. The total distance from Glencoe to Fort Erie is 146 miles. The engineer's estimate of the cost of constructing the road is £5,000 per mile, which includes steel rails, bridges, station bulldings, and approaches, and land; a further supply of rolling stock will not exceed £1,000 per mile in addition, and the engineer undertakes that for this outlay the permanent way shall be equal to that of the New York Central and Hudson River Railroads. It has long been foreseen that the necessity would arise either to build this loop as a relief to the main line, or to double the existing main track. The constantly increasing passenger and freight traffic carried over the narrow gauge route in connection with the continued extension of the American railroads westward, even up to the Pacific Ocean, has nearly reached the capability of a single track of rails, and is already equal to the tonnage carried over many double track railways in this country. In order to facilitate this traffic the Act obtained in the last session of the Dominion Parliament enables the company to take up the broad gauge line of rails on the main line, as well as branches, and thus work the whole traffic over the ordinary narrow gauge of the American roads. The engineer estimates the cost of doubling the present main line from the Suspension Bridge to London at about £5,000 per mile; but it cannot be doubted that the preference must on every account be given to the construction of a loop line, which not only makes a shorter through route, but traverses a new district of country, the local traffic on which (according to competent authority) will afford a net revenue equal to 5 per cent. per annum on its cost. The townships of Southwold, Yarmouth, and Malahide, of which the town of St. Thomas is the centre, constitute one of the most fertile and highly cultivated districts in Western Canada, whilst the business and manufacturing interests of St. Thomas, Tilsonburgh, Simcoe, and Cayuga are not far behind such station on the main line as Paris, Woodstock, and Ingersol. Again, the route to be adopted along the flat table-land level with Lake Erie affords such easy gradients, as compared with the existing main line, that the haulage of heavy through freight trains and fast passenger trains will be greatly facilitated. Considerable economy will thus be effected in the maintenance of way and in carrying greater loads with the same engine power; these two items alone are calculated to effect a saving in money value of £25,000 per annum as applied to the same tonnage carried over the present main line. A very great advantage to be obtained by this loop line is the alternative route it will open to New York. The city of Buffalo is a central point of reception and distribution between New York and Chicago of the immense consignments of cattle and agricultural products from the West, and of the imported and manufactured goods from New York and the New England States. This city is essentially the center for live stock traffic in horses, cattle, and hogs, for dealers have there the advantage of competitive railway routes to the most profitable markets. Comparatively but a very small portion of this traffic now comes over the Great Western Railway, and it is asserted by Mr. Joy, the President of the Michigan Central Railroad, that the increased cost to the Great Western of such traffic by the present route, and the additional business of this description to be obtained *via* Buffalo, will alone cover the interest on the cost of making the Glencoe loop line. There is also a large traffic originating in the city of Buffalo destined for the Western States, part of which now goes to Detroit by water on Lake Erie, and part by the Lake Shore and Grand Trunk roads, but none of which now passes over the Great Western. The value of this access to the city of Buffalo cannot be overrated. It was the terminus originally designed for the Great Western Rail way, but its promoters allowed local influence to divert its course to the shores of Lake Ontario, entailing thereby fifty miles of steep ascending and descending gradients.

"Simultaneously with the Glencoe Loop Line act, the Provincial Legislature of Ontario granted a charter to revive, in the hands of Mr. W. A. Thomson, the long-projected Southern Canada Railway, intended to run parallel to the Great Western Railway. The sudden activity of the promoters of this new line compelled the authorities of the Great Western Railway to direct their attention at once to the absolute necessity of protecting Great Western interests, and as it is now apparent that a line of railway in this district will be at once made, there is no alternative but immediate action on the part of the Great Western. The Southern Canada Railway scheme, as now agitated, is supported by promises of municipal free money gifts, or bonuses, and by the material assistance afforded by a strong combination of American railroad influence, which is fully alive to the importance of possessing another route through Canada. The representatives of these railroads have given the assurance that they are willing to furnish the capital, and as an earnest have paid into Canada banks the deposit required by the act. However reluctant the directors are to recommend fresh expenditure, they consider it essential to the prosperity of this company that such new line should be in its hands, and not controlled in antagonism to its interest. Under existing circumstances the directors are convinced that no aggressive railway of this character can be successfully opposed unless the Great Western are prepared to ensure a line in substitution, and this loop line, they believe, will not only protect the large property of the proprietors, but will also earn a fair return for the new capital invested when worked as an auxiliary to the Great Western. A map of the country, showing these lines of railway, accompanies this paper, or can be obtained on application.
By order of the Board. BRACKSOTE BAKER, Sec'y.
"126, Gresham House, Old Broad-st., London, June 28."

Report of the Board of Directors to the Stockholders of the Chillicothe and DesMoines Railroad Company.

TRENTON, Mo., June 6, 1870.

The fiscal year ending June 6, 1070, marks a period of special interess in the progress and success of your railroad enterprise.

The work accomplished, and the negotiations concluded, insure both the speedy completion of the road-bed, and the ironing and operating of the road.

This success has not been achieved without many delays and difficulties to overcome, which required an abiding faith in the final success of the enterprise, and a determination to carry it through in accordance with the original design, regardless of the fears of some and the hostility of others.

The work of building a railroad exclusively with county bonds, was a new and almost untried experiment, and to do so at a time when the finances of the country were unsettled and its markets flooded with such paper, was an enterprise in which your board hesitated to embark, and did so only after the most mature and deliberate consideration.

The complete success of the enterprise, which the board now regards as assured, will sufficiently vindicate the policy which has been pursued; while a fair consideration of the various difficulties which have necessarily retarded the work, will convince any one that it has been pushed as vigorously as was possible under the circumstances.

At the date of our last annual report the work upon the road-bed had but recently commenced, and but few of the bonds of Grundy and Mercer counties were sold.

Several causes operated to retard the progress of the work.

During the summer and fall of 1869, rains were so frequent and heavy as to render the rapid prosecution of the work on the road impossible; and during the summer of that year the market for county bonds was so poor that it required extraordinary exertions to sell sufficient to pay for the limited amount of work that was done. But since that time the bonds have met with a readier sale, and the work has been vigorously prosecuted.

The Board of Directors of that company, in pursuance of the terms of that contract, on the 2d instant, adopted the line of your road from Princeton to Trenton, or to a point between Trenton and Muddy Creek, where a convenient crossing of Grand River may be found. All the papers necessary to fully consummate the transfer of your road between the points, with the mutual obligations of the companies, have been drawn up and agreed upon, and nothing remains to be done, except the exchange of papers between the parties, which will be done in a few days.

The entire work between Chillicothe and Princeton is now more than half completed, and the board feels certain of being able to fully complete it this season.

On the 20th day of April last, the board, through its duly authorized officers, entered into a contract with the Chicago & Southwestern Railroad Company which provides for a perpetual lease of your road-bed to that company—and binds that company to adopt your road-bed from Princeton to Trenton, and perpetually maintain and operate the same as a part of the main line of the Chicago & Southwestern Railway Company, with the privilege of adopting your line from Trenton to Chillicothe, either as a part of the main line or as a branch.

By the terms of the contract, the Chicago & Southwestern Railway Company is bound to iron and have the road in full operation between Princeton and Trenton within eighteen months, and the Board has assurance that it will be done in much less than that time.

Thus it will be seen that an arrangement has been made which places the counties of Mercer and Grundy, and perhaps Livingston, upon a great through line of railway, connecting Chicago and the East on the one side, with the great grain and cattle-producing region of the Southwest.

Before entering into this arrangement the Board had fully considered several other projects—but it is believed that what has been done will give the West general satisfaction; that the road secured will be one of the best roads in the West, and that it is well calculated to meet the wants and aid in the development of this section of the country.

The total amount of all warrants drawn upon the treasurer, from the organization of the company to this date, including payments for right of way, payments to contractors, engineering, and all other expenses is (estimated in cash), $126,294.16.

Public attention having been called to the expenditures for engineering, officers salaries, and other current expenses, it is deemed sufficient to say in reply, tnat a comparison is invited with any other work in the State of similar magnitude.

County bonds are not cash, neither will they pay expenses, but all have to be reduced to a cash basis. This makes the expenses appear high, but the Board asserts, with confidence, that no railroad in the State, of the same length, has been advanced so far with less expense for engineering and officers salaries, and there is no company within the knowledge of the Board, whose officers and engineers are so poorly paid as those of this company.

The Board, has, from the outset, keenly felt the weight and magnitude of the responsibility which it had assumed, and now looks forward with anxiety to the near approach of the time, when its work will be finished.

By the Board of Directors.

J. H. SHANKLIN.

IRA B. HYDE, Secretary.

Guides and Guide Maps of Railroads.

The editor of *United States Railroad and Mining Register*, in his peculiarly graceful way, having had something to say of tourists' routes in general, and having something still to say of a tour of his own from Philadelphia to Chicago and back by Niagara Falls, Buffalo, and Erie, prefaces the latter with the following on the use of good guide books to railroads in general and to certain specified railroads in particular:

Why, we ask, for the hundredth time, do not our railway companies get up good tourist guide books? Thirty years ago the State of Pennsylvania with an area of 50,000 square miles, one-third garden, one-third forest, and one-third mountain lane, was surveyed, mapped, explored, pictured and described. Two huge quarto volumes, with more than a thousand illustrations of its scenery were published. Who has these volumes? Nobody. A few copies may be consulted with difficulty in the alcoves of our public libraries. A few gentlemen hoard them preciously in their private cabinet. Would it not pay our railway companies to get them disinterred and republished in some handier cheap form for the use of tourists? The people of New England and New York and the Western States are profoundly ignorant of Pennsylvania. Nay, our own citizens, who take the Camden and Amboy schedules, and trot off to well-described and loft-illustrated scenes of nature in New England and the North, are blissfully unconscious of the existence of a world of beauty at the doors of which they live. All the world prates of Cohoes Falls and Trenton Falls; but who ever hears tell of the more romantic falls of the Sawkill and Raameskill near Milford? We hear our readers ask: where is Milford? We feel too indignant to tell them; but if they hunt it up they will find it a more charming summer place than any in New England, on the banks of a broad river, in view two noble ranges of mountains, with its back to a forest full of lakes full of fish, and approached from the Delaware Water Gap and its railway by a carriage road which, it is no exaggeration to say, it is the most perfect lovely carriage road in the United States.

All the world ascends the Cattskill Mountain. Does anybody know that that majestic mountain plateau spreads itself westward over all the northern tier of counties in Pennsylvania, and that the railway up the Delaware River rises from Stroudsburg to the very top of it, and passes over the top of it for miles, at an elevation of 2,000 feet above the sea, through the Shades of Death, past Long Pond, and descends upon Scranton into the famous valley of Wyoming?

Why do not our friends of the North Pennsylvania Railway and our friend, the President of the Lehigh Coal & Navigation Company, or our friends, the rival lines of railroad up the Lehigh by Wilkesbarre, Tunkhannock and Towanda, make a guide book, with detailed local maps, handsome pictures and good descriptions of the exquisite scenery and nice boarding places between Philadelphia and the New York State line?

As for the Pennsylvania Central, which commands all the avenues to the central, western and northwestern regions of the State, there was once sold to travelers, at the depot in Philadelphia, a carefully constructed map of the belt of country traversed by the main line, giving every wind of the road, every gap through which it passes, and every village; so that passengers could tell at a glance, not only where they were, at any given moment, but the name and character of all the prominent features of the landscape. We have a copy of this guide map, but do not know of any one else who has; and will not lend it, although often importuned to do so, because we feel sure we could never get it back again. Let any traveler inquire for it in the West Philadelphia Depot. The boy will stare at him. He never heard of it. The company has forgotten that they ever did such a necessary thing.

This map ought to be printed by the ten thousand, with a revised and corrected text accompaniment, and *given away to all who apply for it*. It would go to all parts of the United States and hundreds of copies would find their way to Europe. It would make the Pennsylvania Central route to the West the best known among all the rival through lines, especially among Western people. It would invite tourists to the lively scenery of the Juniata and its branches, the Allegheny portage and the Conemaugh waters.

The same thing ought to be done in behalf of the Philadelphia & Erie road. There could not be a better advertisement, a better investment at small expense. We do not speak of generosity; we speak of policy, and a large way of looking at things.

There is now every prospect of a speedy completion of the Mont Cenis Tunnel. The *Gazette Official* announces that the total length completed on the 31st of May was 11,180 metres. The distance that has still to be excavated is only 1,030 metres.

General Railroad News.

OLD AND NEW ROADS.

Wilmington & Reading.

This road extends from Wilmington, Del., north by west, crossing the Philadelphia & Baltimore Central near Chadd's Ford, the Pennsylvania Railroad at Cootsville (40 miles from Philadelphia), the Waynesburg Railroad near Moorestown, and forming a junction with the Philadelphia & Reading Railroad at Birdsboro, nine miles southeast of Reading. Its total length is 63 miles. It was opened for business on the 18th ult.

Winona & St. Peter.

The Winona (Minn.) *Republican* learns from Superintendent Stewart that the iron on the Winona & St. Peter Railroad has been laid to a point three miles west of Waseca, and the work of track laying is being pushed ahead as the iron arrives. Mr. DeGraff, the contractor, still has a large force of men at work, and in a few weeks will have the grading completed to the river. It is believed that the cars will be running into Mankato and Saint Peter by the first of October—possibly before. A special election was to be held in Mankato, Minn., on the 20th, to vote upon the proposition to give $25,000 to this railroad to secure its construction into that place on or before the first of January next.

St. Paul & Dubuque.

This is the name of the railroad which is proposed as a connection between St. Paul and the Cedar Falls & Minnesota Branch of Dubuque & Sioux City Railroad—otherwise the Iowa Division of the Illinois Central. Vernon, Dodge county, Minn., has voted $20,000, and Wasioja, of the same county, $75,000 to the proposed road.

Springfield & Northwestern.

Springfield township, by a majority of 335, has authorized a subscription of $50,000 in aid of this road. It having been hinted in a Cass county newspaper that the route from Springfield to Beardstown had been abandoned, the Springfield *Register* says: "For the information of that paper we will state that the first twenty "miles leading out of this citp in that direction has been "placed under contract, and will be completed and in "running order by the middle of October next. We believe it is the intention of the company to complete—"put in running condition—sections of this road as the "work progresses northeast from this city, instead of "letting the whole of the work on the entire line at "once."

The towns of Knox, Henderson, Rio, Chestnut and Orange, in Knox county, will vote on the 30th instant on the question of making subscriptions to the capital stock of the company.

New Railroads to Jacksonville.

On last Monday, the 18th instant, the bids for the grading, building bridges, trestle-work, etc., of the Illinois Farmers' Railroad, from Jacksonville to Franklin, and of the Jacksonville Northwestern & Southeastern Railway, from Franklin to Waverly, were opened at the office of M. P. Ayers, President of the Farmers' road, in Jacksonville, and the contract for the grading was awarded to the Hon. Wm. Sheppard, of Jerseyville, Ill., and for building bridges and trestles, to Mr. Ralph Reynolds, of Jacksonville. By the terms of the contracts with these gentlemen, the work is all to be completed, ready for the ties and rails, by the first of next October.

Kansas City & Memphis.

An item from some Missouri paper copied in THE RAILROAD GAZETTE of the 9th instant, concerning the proposed Clinton & Memphis Railroad, says that the latter "is designed to supplant the Memphis & Kansas "City Railroad Company, which organization, it has "been discovered, has no legal existence." To correct this statement Mr. J. D. Williams, Secretary of the Kansas City & Memphis Company, writes to us that the company has had a legal existence since the 30th of October, 1869, and has now; that the County Court of Jackson county on the 7th of July (the present month) subscribed $3,000 toward the preliminary and final survey of the road in that county; that the engineering corps has been at work over three months and has 72 miles of line surveyed, and is now making the final survey in Jackson county; and that, when this is done, the work of construction will be commenced and prosecuted vigorously. All of which indicates that the company is neither dead nor sleeping, but active and not to be "supplanted" at will.

Atlanta & Richmond Air Line.

This company is formed by the consolidation of three other companies, each having in charge the sections of a railroad from Atlanta, Ga., to Charlotte, N. C., in Georgia, South Carolina and North Carolina respectively. It is intended as an extension of the Richmond & Danville and Richmond & York River roads, and its President, Col. A. S. Buford, is also President of those companies. Gen. A. Austell, of Atlanta, is First Vice-President, and R. Y. McAden, of Charlotte, Second Vice-President. More than 600 men are working on the line in Georgia, and have been for some months, and a larger force is soon to commence grading in the Carolinas. A contract has been made with P. P. Dickinson, of New York, for the completion of the whole line, 225 miles long, within two years.

The President, in his address to the stockholders of the consolidated company, said that he expected during the year 1872 to run a train without change from the waters of Chesapeake bay to Atlanta, Montgomery, Mobile and New Orleans. All the counties of Georgia and South Carolina through which the air-line is expected to pass are subscribing liberally to the work. The line is to run from Charlotte, north of Yorkville, *via* Spartanburg and Greenville, S. C., Gainesville, Ga., etc., to Atlanta, 225 miles. The road is now in operation from Atlanta eastward in Georgia twenty miles, and thirty-three miles more in that State are under construction, which it is expected will be completed by January, 1871.

St. Louis & Southeastern.

The City Council of Shawneetown on the 9th inst. subscribed $25,000 to aid this company on condition that the road shall be completed through Gallatin county by the 1st of November, the bonds to be delivered when a continuous line is constructed from Shawneetown to the Illinois Central.

Baraboo Air-Line.

A contract with the Chicago & Northwestern Railway Company has been signed which secures, under the management of the Baraboo company, the construction of the road from Madison to Baraboo by the first day of July, 1871, and to Reedsburg within five months thereafter, conditioned that $175,000 is voted by the towns interested, and the right of way and depot grounds deeded to the company.

The survey will be undertaken at once and probably, according to the Baraboo *Republic*, by Mr. Van Meenan who ran the former survey and whose services, together with a corps of assistants, have been tendered to the President. The distance from Madison to Baraboo is about 38 miles and from Baraboo to Reedsburg, about 14 miles.

Atchison & Nebraska.

The Atchison *Champion* of a late date says: "We "hope to be able to announce, within three or four "days, the conclusion of a contract for the necessary "iron for this road from Atchison to White Cloud; and "it gratifies us to state, in this connection, that the road "will, if this contract is concluded, remain under the "control and management of the company that has "built it." The *Champion* charges that personal difficulties among the directors have so far prevented its completion.

Hastings & Dakota.

The Hastings (Minn.) *Union* says that this road has, through its new Board of Directors, received a large accession of means for the further prosecution of the work, and that the early construction of the entire line is confidently expected.

Chicago & St. Paul.

Langdon & Co. have the contract for completing the grading of the railroad bed from Red Wing to Winona, Minn., by July next. The iron intended for the Eastern Connection, which has probably arrived at Winona ere this, has been ordered to Hastings, and the work of laying the track between Hastings and Red Wing was expected to begin this week.

Lafayette, Muncie & Bloomington.

A correspondent of the Bloomington *Leader* proposes that this road seek an eastern outlet through the Chesapeake & Ohio Railroad to Norfolk by building an extension from Muncie southeastward through Burlington and Lynn, Ind., and Dayton Wilmington, Hillsboro and West Union, O., to Portsmouth, on the Ohio River.

St. Louis & St. Joseph.

The report that this road had been purchased or leased by the North Missouri Railroad Company is incorrect. An arrangement, however, has been made by which the North Missouri will operate the St. Louis & St. Joseph Railroad, and by which through trains will in a few days run to St. Louis from St. Joseph. This will form the shortest route between St. Louis and St. Joseph, and, probably, will be the only one on which cars will run through, unless the Missouri Pacific should make an arrangement with the Kansas City, St. Joseph & Council Bluffs Railroad.

Kansas Pacific.

The increased labor and expense caused by a lack of timber on a railroad line is well illustrated by the following, which appears in the Denver *News*:

"The Kansas Pacific Railway Company has 581 teams hauling ties, independent of contractors who are delivering on the line of the road, Of these about one hundred teams are mules, six to the wagon, and the balance cattle, employing about 5,000 oxen. A round trip for all of those furnishes ties for about twelve miles of track. At last accounts from below the ties reached this side of the 500th mile post. In no other country could such work be successfully carried on—hauling such vast quantities of timber more than a hundred miles, and subsisting the teams that do the work on grass alone. There was no stoppage of the teams at any time last winter. East of the Missouri there is much of the year when such loads cannot be moved at all, and food for the stock must be provided."

The Junction City *Union* says the Kansas Pacific Railroad Company has appointed R. S. Elliott as "Industrial Agent" to investigate the capabilities of the country along their road for the plantations of forests; and to get exact information in regard to water supplies for settlemants. His labors will extend in part of Kansas, and in most of Colorado. This is the first scientific movement yet made, we believe, on purpose for the redemption of the plains. If the plains are ornamented with forests, rain may be drawn, vegetation may spring, and the desert may bloom!

Lake Superior & Mississippi.

The company is constructing at Duluth a freight house 225 feet by 22, one-story high, two-stories high at one end, where the offices will be located. It is built on the cribs on the lake front of the city.

Ottumwa & St. Paul.

The Buchanan County *Bulletin* has information to the effect that the engineers will commence a survey of the line, *via* Marengo, Blairstown, Vinton and Waterloo, about the 25th inst. Mr. Dixon, Secretary of the company, says in a private letter: "The country between "the Iowa and Skunk rivers, I have no doubt, will be "found difficult, whether we should attempt to get "through *via* Brooklyn, Victor or Marengo. We expect "to spend considerable time and money necessarily, in "engineering through this portion of the country, be-"fore permanently locating the road. * * * * We "desire to treat the people of every locality fair, and "want all to understand that feasibility of route and the "amount of local subscriptions will probably have a "controlling influence in the matter of location."

Atchison & Nebraska.

The route of this road is from Atchison, Kansas, northward, crossing the St. Joseph & Denver Railroad at Troy sixteen miles west of St. Joseph, and fifteen miles north of Atchison, striking the Missouri at White Cloud, eighteen miles further northwest, and continuing up the river to Rulo and beyond. The road bed is completed and ready for the ties between Atchison and Troy, and a large part of the grading is done between Troy and St. Cloud.

Grand Rapids & Indiana.

Last week the track was laid on this road from Sturgis, where it crosses the Michigan Southern, northward nearly to Vicksburg. It is promised that it will be completed to Kalamazoo by the middle of August.

Belleville & Southern Illinois.

Massac county lately gave 576 majority in favor of granting $125,000 aid to the company. The city of Metropolis gave an almost unanimous vote in favor of a subscription of $50,000. The company has ordered nearly half a million dollars worth of rolling stock, including eight new locomotives and several passenger coaches. The Pinckneyville *Banner* learns that the road will probably be finished before contract time and that "the grading is well advanced and is now being pushed "forward vigorously. It is estimated that there are al-"ready ties enough in Perry county to lay the whole "length of the line through its borders. The piles for "Beaucoup bottom are being delivered, and the pile-"driver will be here soon."

Havana, Mason City, Lincoln & Eastern.

A company of the above name proposes to build a railroad from Champaign City to Warsaw, on the Mississippi river, running through Clinton, Lincoln, Mason City, and crossing the Illinois river at Havana, and thence west to the Mississippi river at Warsaw. The Peoria *National Democrat* is authority that the company have secured one million dollars in stock, by county and township subscriptions, making six thousand dollars per mile on the whole line of 175 miles.

Thomas Snell, of Clinton, Dewitt county, is President; James Deland, of Clinton, R. B. Latham and Silas Beason, of Lincoln; H. T. Strawn, of Mason City; Lyman Lacey and James H. Hale, of Havana, are directors.

Rockford Rock Island & St. Louis.

Sterling, Whiteside county, lately voted against a proposition to subscribe $50,000 in aid of the road.

European & North American.

This is the railroad which is to connect St. Johns, New Brunswick, and eventually Halifax, Nova Scotia with the railroads of the United States. The Frederic-

ton (N. B.) *Farmer* says that the construction of the Maine portion of the Western Extension is now apparently certain. Congress has admitted the claims of Maine, and the work will be proceeded with immediately. Congress passed a bill to pay the European & North American Railway Company $678,362, interest due the States of Maine and Massachusetts for money expended in the war of 1812.

Southern Minnesota.

The Blue Earth City *Post* announces with many regrets that the company has decided not to build west of Wells in the direction of Winnebago City this year. The reasons assigned are first, it will take all the means the company can command to fill in the gap between Lanesboro and Ramsey and extend the road from Wells to Mankato; and second, that by building from Wells to Mankato first they will be able to get ties much cheaper.

Nebraska Railroads.

A correspondent of the Quincy, Ill., *Whig*, writing from Tecumseh, near the southeastern corner of Nebraska, says of the Brownville & Fort Kearney Railroad, which is projected to run in connection with the Quincy, Missouri & Pacific Railroad: "These two roads "are often spoken of here as the Quincy, Brownville & "Fort Kearney. Johnson county proposes a subscrip- "of $100,000 to the stock of the Brownville & Fort "Kearney road, which is regarded as the best calculated "to develop the wealth of the country and open "communication with the East. Another projected "road is the Nemaha Valley & Loup Fork, running "from Rulo, on the Missouri, to Lincoln. The "survey of this has been made and the county has "subscribed $100,000 to its capital stock. A third road "is the Nebraska City & Southwestern, which has been "surveyed from Nebraska City to beyond this point. "Creat confidence is felt in regard to all these roads. "The surveyors from Brownville are expected to reach "this point in a short time and this (Johnson) county "will give $1,000 to aid in defraying the expenses of the "survey."

Mobile & Ohio.

Mr. G. W. N. Custis, formerly Superintendent of the Camden & Atlantic Railroad, of New Jersey has been appointed General Superintendent of the Mobile & Ohio Railroad in place of L. J. Fleming. Under date of July 1, he issued the following circular, which gives the organization of his department:

"Under the organization of the Superintendent's Department, provided for by general notice of June 17th, the road will be operated in three divisions as heretofore with a Division Superintendent to each, as follows, viz:

"The road from Mobile to Shubuta, both included, will be denominated the Alabama Division, with Mr. Cecil Fleming, as Division Superintendent.

"The road from Shubuta to to Baldwyn, the latter included, will be denominated the Mississippi Division, which, with the branches from points thereon, will be operated by Mr. E. S. Hosford, as Division Superintendent.

"The road from Baldwyn to Columbus, Kentucky, the latter included, will be denominated the Tennessee & Kentucky Division, with Mr. M. M. Miller, as Division Superintendent.

"All men employed in the movement of trains; in providing wood and water; in cleaning engines and cars, or in other service pertaining to the Superintendent's Department, will be under the immediate direction of the Superintendent of the Division upon which employed, be responsible to him, and be subject to his orders. In the case of operatives, who in the discharge of their duties may pass from one division to another, special provision will be made from time to time for their employment and direction; but if engaged in the movement of trains, they will be under the direction of the superintendent of the division upon which they may be at the time, in all that pertains to such movement.

"Station agents will be subject to the direction of superintendents of divisions upon which located in all that pertains to the safety and dispatch of trains or cars.

"With this general notice of organization, permit me me to enjoin upon all a thoughtful and faithful discharge of duty. Every man knows what his particular work is, and upon that faithful and thoughtful doing of your particular work depends the safety of the company's property, and your own standing; and if this be not enough, bear in mind also, that upon that same faithful and thoughtful doing of your particular work depends the safety of human life. He who regards not these things, is out of place on a railroad.

"Specially, I enjoin sobriety. 'Tis due to the public as well as to the company that no man be permitted to hold a position which has to do with the safety of human life, who is liable to be under the influence of intoxicating liquors."

Railroads in Germany.

According to the railway statistics collected and compiled by the Association of German Railways, there were forty-three railways and extensions opened in Germany and the German provinces of Austria during the year 1869, with an aggregate length of 197 Prussian (about 1,000 English) miles, showing an increase of 61 German miles over the preceding year. Their territorial division shows 71.3 German miles in Austria, 48.85 in Prussia, 29.6 in Wurtemburg, 14.7 in Hesse-Darmstadt, 10.9 in Baden, 6.8 in Bavaria, 5.9 in Saxony, 4.9 in Oldenburgh and 4.5 in Schwartzburgh-Sondershausen. To this must be added 64½ German miles of State railways opened last year, and belonging to Baden, Bavaria, Oldensburg, Prussia, Saxony, and Wurtemburg, and nearly 133 German miles of branches and junctions constructed by seventeen of the older and five new companies. With these additions there are now in Germany (including Schleswig and the German provinces of Austria) 2,921¼ German (or nearly 15,000 English) miles of railway running passenger trains, which are thus distributed over the following twenty-three States: Prussia (including the newly acquired territory) 1,333 German miles, Austria, (exclusive of her non-German provinces) 593¾, Bavaria 362½, Saxony (exclusive of her coalmine railways) 134, Baden 123¾, Wurtemburg 126, Grand Duchy of Hesse 60½, the two Grand Duchies of Mecklenburgh 46, Brunswick 29¼, Anhalt 23¼, Oldenburg 12¾, Saxe-Coburg-Gothe 13⅓, Saxe-Meningen 13, Saxe-Weimar 12, the Hanseatic cities 9½, Saxe-Altenburg 9, Schwartzburg-Sonderhausen 5, Reuss 4, and Schaumburg-Lippe 3¼. Lichtenstein, Lippe-Detmold, Schwartzburg Rudolstat, and Waldeck, are without any railways in their territory. In Hungary and the other non German provinces of the Austrian Empire three sections of together forty-one German miles were opened during the year. In the whole of the Austrian Empire 1,104 German miles of railway are now open for public traffic, of which 510 are in the non-German provinces, and about 30 are worked by horses. At the commencement of the present year the Association of German Railways extended over 3,732¼ German (18,660 English) miles, and were worked by 77 different companies, of which 49 were German, 23 Austrian, and 5 foreign. Of the above-mentioned railway lines, 1844 German miles belong to private companies, and 1,077 to the different States. Of the latter description, 45½ German miles are in Prussia, 167 in Bavaria, 135 in Wurtemburg, 111 in Baden (including 4 German miles in the terrritory of Switzerland), 100¾ in Saxony, 35⅞ in Brunswick, 15½ in Mecklenburg-Schwerie, 15½ in Hesse-Darmstadt, 13½ in Oldenburg, 1¾ in Anhalt, and ½ in Saxe-Coburg-Gotha (worked by horses.)—*Hamburg Correspondence London Railway News.*

MISCELLANEOUS.

—It is poor policy in any transportation company to overlook any proper and natural means for making their line a favorite, especially with the inhabitants of a large city. Business has no heart. True, but it ought to have head enough to simulate a heart. There is such a thing as making all sorts of people love—actually love—a dead, inflexible, obstinate, noisy, dangerous thing like a railway. Only oblige them often enough and in delicate ways, and they will caress and defend and spend money for a "soulless corporation" in a pinch. And no railway company can forsee when a pinch will come to it. We wish all our own local railway trains out of Philadelphia were managed with a really honest, hearty, sympathizing feeling for those who go out and in on them every day to and from their homes. A cordial affection might be easily made to spring up between all parties. If a few nuisances, like the candy-boy and magazine nuisance, and the engine-driver's whistle-correspondence nuisance, were abated, the kind attention would be worth more than money towards winning good opinions for the road.—*United States Railroad and Mining Register.*

—In the suit of Daniel Lyons against the Erie Railway Company, to recover $50,000 for personal injuries sustained by the Carr's Rock disaster, on April 13, 1858, the jury, after two hours' deliberation, returned a verdict for the plaintiff for $20,000. Judge Murray, in his charge to the jury, said that the company as common carriers were by law under obligation to keep their road in perfect order, and were responsible in damages for the result of any negligence; and according to the testimony the company was guilty of negligence.

—The House, during the late session, passed but four bills relating to railroads. The first was the Northern Pacific; the second was one giving ten sections of land per mile for a road, about sixty miles long, in Oregon, with the proviso that the land must be sold at at $2.50 per acre; the third was that giving the right of way, two hundred feet wide, to a road from Oregon to Salt Lake City; and the fourth was one changing the location and reducing the land grant of a line in Oregon. All these bills became laws, except that for the Salt Lake road, which did not reach the President till two minutes after adjournment. The only railroad bills not passed by the Senate were those it could not reach for want of time; but they are on the calandar, and will come up at the next session.

—The Salem, Missouri, *Monitor* of the 8th inst. says: "Messrs. Crawford & Scott of Pennsylvania, who visited our place last week, purchased from C. C. Simmons the noted iron mountain near Salem. Messrs. Speers & Zane of St. Louis, who were here at the same time, purchased the Orchard iron mountain, the iron hill of Mr. Hayes and one of Mr. Norris. Wm. James, of St. James, some time since, purchased the hill formerly owned by Thomas Pomeroy.

"All these gentlemen are well known capitalists, and men of influence in railroad and financial circles. Mr. Scott was formerly President of the Erie Railroad. Mr. Crawford is at present President of the Pittsburgh & Erie Railroad. Messrs. Speers & Zane are connected with the Carondelet iron works."

—The New York Canal Board at its recent session, adopted a resolution that on and after the 20th day of June, 1870, car-axles, boiler iron, iron and steel in bars and bundles, and all articles exclusively manufactured of wrought or rolled iron not specifically enumerated in the toll sheets, when cleared at tide-water, be charged at the rate of one-half of one mill toll per 1,000 pounds per mile.

ELECTIONS AND APPOINTMENTS.

The annual election of directors by the stockholders of the Missouri & Mississippi Railroad Company in Macon city, July 14, resulted in the choice of the following named gentlemen as members of the new board: Jas. W. Lewis, A. W. Roper, Glasgow; Jas. A. Reid, Geo. W. Fulton, S. M. Wirt, Edina; Lucius Salisbury, Salisbury; F. A. Jones, D. W. Roberts, Isaac Hays, Macon.

The officers chosen for the ensuing year are: Jas. W. Lewis, Glasgow, President; Jas. A. Reid, Edina, Vice-President; Albert Blair, Macon, Secretary; Henry S. Glaze, Macon, Treasurer; Lucius Salisbury, Salisbury, Financial Agent; Augustus N. Hyde, Macon, Chief Engineer; Chas. P. Hess, Macon, Local Commissioner.

—N. W. Hungerford, late of Philadelphia, has been appointed Superintendent of the Lake Superior & Mississippi Railroad, in place of Gates A. Johnson, Chief Engineer, and Mr. Alexander, Assistant Freight Agent of the Milwaukee & St. Paul Railway, has been appointed General Freight Agent of the same road.

—Mr. Edwin Stratton of Shelburne Falls, Mass., has been appointed acting Chief Engineer of the Boston, Barre & Gardner Railroad.

—John Bentley has been appointed ticket agent of the Illinois Central Railroad at St. Louis, in place of I. F. Randolph, who is assigned other important duties in the company's service.

—Mr. Carter Hillyer, of Augusta, a son of Julius Hillyer, of Athens, has been appointed Auditor of the Georgia Railroad and Banking Company.

—The stockholders of the Peoria & Farmington Railroad Company met at Peoria on the 9th instant and effected an organization by the election of the following directors: George C. Bestor, Robert Boal, John T. Lindsay, William Kellogg, and George L. Bestor. At a subsequent meeting the directors elected George C. Bestor, President; William Kellogg Treasurer; and George L. Bestor Secretary.

The President was authorized and required to cause two or more routes to be surveyed, "one of which shall "run through Hollis township, by the way of Lamarsh "creek, and the other lines shall be in such routes (in- "cluding the old Peoria & Warsaw route) as shall be "deemed advisable; and that he cause a profile of each "route to be made, with an estimate of the cost of each, "including right of way."

—G. W. N. Custis, late General Superintendent of the Camden & Atlantic Railroad, has succeeded L. J. Fleming as General Superintendent of the Mobile & Ohio Railroad.

—At the annual meeting of the Portland, Saco & Portsmouth Railroad Company at Portsmouth, N. H., on the 6th ult., the following gentlemen were elected directors for the ensuing year: Ichabod Goodwin, Portsmouth; Charles E. Barrett, Portland; Stephen H. Bullard, Boston; John B. Brown, Portland; Nathaniel Hooper, Boston; S. Lothrop Thorndike, Boston; Asahel Huntington, Salem. It was voted by a large majority of the stockholders that the present contract with the Boston & Maine and Eastern Railroads, and Portland, Saco & Portsmouth road, be annulled.

—Col. Fred Colburn, late of the Ohio & Mississippi Railroad, and formerly of the Indianapolis & St. Louis, has been appointed Ticket Agent of the St. Louis, Vandalia & Terre Haute Railroad, in St. Louis. He is spoken of as one of the best ticket agents living.

—In the new organization of the Mississippi Railroad Company, Ex. Norton, James B. Alexander, Henry S. McComb, D. M. Henning, W. B. Greenlaw, J. L. King, J. L. Norton, A. H. Kerr, and W. H. Worten are directors; Ex. Norton is President, W. B. Greenlaw Vice-President, J. L. Norton Treasurer, Isaac Morrison Secretary, and Thomas H. Millington Chief Engineer.

TRAFFIC AND EARNINGS.

—The Pittsburgh & Connellsville Railroad had in operation during the last fiscal year 54½ miles of main line, from Pittsburgh to Connellsville, and a branch 12 miles long from Connellsville to Uniontown. The earnings of this road for the fiscal years ending October 31, 1868 and 1869, were as follows;

	1868.	1869.
From passengers	$163,456 48	$169,675 75
" freight	337,691 19	430,016 88
" mail	3,650 00	3,650 00
" miscellaneous	3,898 25	8,576 06
	$508,695 92	$608,918 69
Expenses, viz.;		
Conducting transportation	$80,113 16	$94,819 76
Repairs of motive power	104,950 34	116,708 03
Maintenance of cars	26,363 75	36,011 79
Maintenance of road	100,275 01	137,165 36
General expenses	16,858 29	16,860 03
	$327,560 55	$401,564 97
Leaving net earnings	$181,065 37	$207,353 72

MECHANICS AND ENGINEERING.

The Westinghouse Brake.

Our readers will remember the trial of the Westinghouse air brake which was made in Chicago last fall, and which attracted the attention of railroad men as very few experiments do. Mr. Westinghouse was in the city yesterday, and we learn from him that the brake has been adopted very extensively since the time of the trial. The Pennsylvania Railroad has it applied to 200 cars, and is putting it on all locomotives and cars as fast as possible. It will in a week or two be used on the fast train running through from Chicago to New York over the Fort Wayne and the Pennsylvania roads. Its use is also continued on the Panhandle Line. As soon as possible after the trial here it was put on the Kalamazoo accommodation of the Michigan Central, and is now used on the Pacific express also. Almost at the same time it was applied to a train on the Chicago & Northwestern, and it is now used on the Geneva passenger and the Kenosha passenger trains of that company. An accommodation train on the Lake Shore & Michigan Southern, running from Cleveland, is provided with it. The Union Pacific has it on all through passenger trains, the necessary apparatus being attached to 19 engines and 50 cars. The Illinois Central has it applied to a pay train which stops very frequently. The Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific have each ordered it for trial on one train. A manufactory was established in Pittsburgh shortly after the trial here, and sales amounting to more than $100,000 have been made of the apparatus since that time, and there are new orders constantly.

The reader can judge for himself whether the invention is meeting with favor from those who best understand it.

Unloading Gravel Cars.

In the issue of the RAILROAD GAZETTE for July 16 we spoke of the new device for unloading gravel cars in such a manner as to convey the impression that they were the invention of Mr. Lunt, who has charge of the working of one on the Indianapolis, Bloomington & Western Railway. Mr. E. Thompson, of Hokah, Minn., is the inventor, and by him a right to manufacture has been transferred to Mr. J. J. A. Quealy, of Logansport, Indiana, who has a contract on the before mentioned railroad.

The Tender-Hearted Engineer.

These locomotive engineers are a peculiar class of people. Some of them are very superstitious, and feel almost as bad about running over a man and killing him by accident, as though they had done it purposely. Others look upon it only as one of the incidents of the profession.

"That is the eighth man I've killed," said Jack Smith, gloomily, after the Coroner had "sat" on the victim. Jack was engineer on the Cleveland & Toledo Railroad, and one of the best that ran into Cleveland some ten years ago.

Hundreds of people made it their habit to walk on the track for a mile or two out, and as there were several tracks with trains passing and repassing constantly, careless or deaf people (and deaf folks always seem to prefer a railroad track to walk on), in stepping off the track to get out of the way frequently get right in the way of one approaching unobserved in another direction. In such cases, however careful an engineer may be, he cannot prevent a catastrophe.

"Yes," said Jack, after brooding over it in a very melancholy way, "that's the eighth man I've killed in jes' that way—walking on the other track, and then stepping right in front of my locomotive 'thout once seein' me. But this is the wust case of all," continued Jack, producing his pocket-handkerchief and blowing his nose with much feeling, "wust case of all, and I feel dreful about it." His voice trembled, and a tear trickled down his bronzed cheek.

"How worst of all, Jack," I inquired.

"Why, you see," said Jack, "he was a big fat man and he mussed my engine all up!"

Railroads in Japan.

The Japanese petition to their Government, advocating the introduction of railways, a translation of which has been recently presented to the British Parliament—and which is quaintly entitled "A Proposition for the Creation of a Source of Wealth for the Promotion of the Imperial Felicity, and the Establishment of an Unlimited and Everlasting Benefit to the Nation"—contains some pregnant observations. "None of the six continents seem comparable to Europe for extension of enlightenment and wealth in mechanical appliances. Indeed, the continent of Europe alone excels all the other five continents together. What is the reason of this state of things? The sole reason is, that Europe is more enlightened and *better provided with machinery*. The men of the West have a saying, that if you wish to learn whether a nation is rich or poor, strong or weak, you must first ascertain how it is provided with machinery. The invention of the steam engine, and the introduction of more efficient modes of locomotion, have enabled those countries to provide every facility for transport, both by land and sea. It is, therefore, not surprising to find them so wealthy and so powerful." In these few words we see signs of the great changes the revolution has worked upon a country which a few years ago was chiefly celebrated for its isolation.

The importance of opening out to trade the resources of a country which is about 1,500 miles in length, and has a population of upwards of 50,000,000, is now becoming the leading topic of thought in the minds of governing Japanese. The soil is rich, the national capacity of the people, whether manifested in politics or otherwise, is good; but the energy of the Japanese as a mass, is said to be on the decline, the national debt is increasing, and all simply because the means of communication by land and sea are deficient. Japan, unlike China, does not possess navigable rivers; the rate of traveling only averages twenty miles a day, and provinces which are separated by intervals of 400 or 500 miles are at nearly a month's distance from each other. The two capitals of Yeddo and Kioto, though connected by the best line of road in the country, are a fortnight's distance apart. The eastern and western provinces are distant from each other, and their language and manners are different, so that they almost resemble distinct countries.

One part of the country may be starving for want of the rick which another district produces largely while its own produce, perhaps silk, is lying idle for want of means of exportation. It could not be expected that a nation could prosper under such conditions as these. The most productive country in the world would get into debt if it had not the means of turning its produce to advantage. No one has seen this more clearly than Sir Henry Harkes. He had many opportunities of discussing with the Mikado's government the desirability of introducing railways and telegraphs into Japan. The Japanese soon became impressed with the justice of these views, and at the close of last year they informed our minister that they had resolved to construct a railway between Yeddo and Kioto. There were also political reasons for the construction of this line. The Mikado had always resided at Kioto, which is the old capital; after the revolution he moved up to Yeddo, at which place he now lives. The two places being a fortnight's journey apart, it was obvious that much danger might accrue to the nation from any disturbance in the country of the old capital, before any attempt could be made to suppress them. But if a railway and telegraph existed, then news might be sent and troops despatched at once.

However, the difficulty in making a commencement lay in want of funds, and this was soon overcome by an offer on the part of Mr. H. N. Lay, C. B., to lend the Government £1,000,000 sterling on the security of the projected line and Customs' revenues. The offer was accepted, and the Japanese loan has been announced in London through Messrs. Schroder & Co.

Three lines are in contemplation: one principal line from Yeddo to Osaka, the port of Kioto, a short line from Yeddo to its port Yokahama, and a third from Osaka, passing through Kioto and connecting the Biwa lake with with the port Tsuruga. It is, we believe, intended to construct the Yeddo and Yokahama line first, in order to reconcile the popular mind, and to show, practically, the commercial importance of this means of transport. At the present time little has been done beyond engaging the staff and finding the money. Mr. George Preston White, the consulting engineer to the Indian government, is acting as consulting engineer in this case also. Mr. E. Morel, whose name we have mentioned before in connection with the scheme, has already reached Japan, with three surveyors to commence operations. Two more surveyors are going out shortly. The nature of the country, as far as it is possible to know it without the results of actual surveys, which have yet to be made, is favorable, being generally level, with here and there hilly places. Of course nothing has been decided as to gauge, permanent way, or rolling stock; but it is probable that a narrow gauge of 3 feet 6 inches, or thereabouts, will be adopted. It is intended to execute the whole of the work as far as possible, with native labor, and it is suggested that the rate of pay should not be fixed too low, but rather that an interest in the undertaking should be excited by a pecuniary stimulus.

It has been objected that the introduction of these railways will deprive a large number of boatmen, chair-bearers, and horse-boys of their sources of living; but the objection has no more weight than the similar one raised in this country under similar circumstances. The large employment which will be given to people of this stamp during the few years that must elapse before the works are completed, will serve to show them that there are more ways than one of earning a living, and moreover, when trade is increased, the demand for labor will also increase proportionately.

Besides the districts included in the comparatively small network of railways sketched out by the present promoters, there are others which must ultimately be similarly provided for. The Japanese seas are not notoriously stormy, and as many parts of the country are only accessible through the Treaty Ports, the trade with those districts must necessarily be open to irregularities. The steamers from Shanghæ touch at Nagasaki, and then proceed to Hiogo through the Inland Sea. Yeddo will be easily reached by rail from Hiogo. But the other extremity of Japan is not so fortunate. To reach Nii Gata, the port for the rice district, and Hakodati ships have frequently to pass through great dangers, besides which there isalways delay. A line from Nii Gata to Yeddo would place the former port in connection with Yokohama, and at the same time would open out the silk districts of Mayebash, lying between the two.

Next in importance to the railways is the telegraph. Here also the Japanese are determined not to be idle. The line constructed by Mr. Brunton, between Yeddo gnd Yokohama, is in active work, and it is being extended to Osaka. Many Japanese foretold failure when the erection of the telegraph was decided upon. It was believed that the wires would be continually cut, and that the popular mind would associate it with necromancy and Christain propagandism. The only injury done, however, has been some hacking of the posts, and a single wire is found scarcely sufficient for the service.—*The Engineer.*

Canal-Boat Propulsion.

We have several times alluded in recent issues of the *American Artisan* to the matter of chain-towing on canals, a question that must excite attention until it is fully answered by the substitution, for canal-boat propulsion, of steam in the place of animal power. Although rather overslaughed by the rapid development of the railway interest during the past few years, our canal system must always hold its place as affording the cheapest means of transportation for vast quantities of bulky freight, for it must be remembered that a single boat, drawn by a ramshackle horse driven by a vagabond boy, often moves to market a greater weight of grain or merchandise than a whole train of cars. Could the power that drives the locomotive be harnessed to the canal-boat, the utility to the public of slack-water navigation would be multiplied in no small degree, and that this has not already been done is one of the anomalies that arise from ignoring apparently minor but not really important conditions in attempting to overcome an engineering difficulty.

This difficulty in the matter of canal propulsion has been the washing of the banks. To avoid it many different forms of propelling apparatus have been devised, and each has failed. The chain-traction system triumphant abroad has met with no approval here, the reason of which we are unable to give, unless it be that the canal and river navigation to which the plan has been adapted in Europe provides broader channels, and thereby facilitates the passage of the boat by enabling the water in front to pass more readily around its sides. It is a truth too often lost sight of by projectors that in the progress of a boat all the water in front must be displaced and made to pass around and behind it. The speed must, therefore, bear a certain ratio to the space between the boat and the sides of the canal, and any attempt to exceed this speed will have the effect, first, to wash the banks by the heaving up of the water in being forced through the too narrow space allowed for its displacement; and second, an increase of draught, arising from the greater resistance of the water in front due to the difficulties interposed to its lateral escape. Even chain traction, therefore, will not avail beyond a certain point, and any other will be equally, or even more, inefficacious for increased speed. Our contemporary, the *Iron Age*, seems to ignore this evident aspect of the case, for that journal claims, to quote literally:—"What is needed is a powerful tug capable of moving from three to six freighted boats at a speed of from three to five miles an hour. When this is accomplished, the difficult problem will be solved, and not till then." The *Iron Age* then proceeds to mention a boat of novel design which has been successfully tried on the river—just the place where it should not be tried. It is said that the inventor proposes to subject it to further tests, and we hazard nothing in saying that if he will do so under the identical conditions required in canal transport we shall hear nothing more of the project.

The case, in a nutshell, appears from the best available data to be this. At present rates of speed, chain traction would suffice to draw the boats, probably with greater economy than is done by horses, although this yet remains to be decided. But to add in any considerable degree to the number of miles traveled per hour, the canal or water-course must be enlarged sufficient to allow the increased displacement, This must, therefore, be preliminary to the practical success of any system of propulsion aiming at more rapid transit. Before our present issue shall come before the eyes of our readers, the Commercial Union of the State of New York will have met at Rochester to consider the subject of canal improvement. It is to be hoped that their recommendations will take a form leading to a permanent improvement of our canals that shall render possible the adoption of some better system of propulsion, rather than to the trial of schemes that in the present condition of things can only amount to nothing.—*American Artisan.*

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

CONTENTS.

Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

☞ *Our Prospectus and Business Notices will be found on the last page.*

RAILROAD VIADUCTS OVER STREETS.

At last the interruptions occasioned by the meeting of the currents of street travel on some of our Chicago streets with the movement of trains through the city have become almost insufferable. Travel on the streets is suspended frequently and for considerable periods, and trains on the railroads must move very slowly and with great caution, and yet accidents are not uncommon. Just now the attention of the city is drawn particularly to the line by which the Chicago, Burlington & Quincy Railroad crosses the South Division. It crosses this division where it is narrowest, just north of Sixteenth street, and the streets which it crosses are Clark, State, Wabash avenue, Michigan avenue and Indiana avenue. Clark street at this time is occupied by a railroad track at Sixteenth street, and little trouble has been experienced with the crossing there. Indiana avenue, where it is crossed, is chiefly occupied by railroad shops, and no fault is found there with the passing of trains. State street, Wabash and Michigan avenues are well built up and have a movement of vehicles and foot passengers scarcely equaled elsewhere in the city so far from the centre of business.

Complaints are made now that the growth of business on this railroad, and especially the increase in the number of freight cars drawn over it for the Illinois Central Railroad, and to be transferred to the Michigan Central, (the former having its outlet for its Iowa lines, and for a large part of its Dunleith line over the Chicago, Burlington & Quincy Railroad) have so obstructed these thoroughfares as to seriously incommode the business on them, and to materially decrease the desirableness—and consequently the value—of the property on the streets south of the crossing. Probably no one denies these statements *in toto*. That the crossing is a nuisance is confessed by all, and by none more readily than the officers of the railroads. They suffer by the interruptions much more than any other one interest. An accident which kills the horse or demolishes the dray of a citizen may cost them some thousands of dollars. The delay in moving passengers and freights caused by the necessity of crossing these streets at a very low rate of speed is a greater disadvantage than most would think. Suburban traffic, especially, is affected by it. If the Chicago, Burlington & Quincy trains could run rapidly from the depot to the city limits, its suburban traffic could be increased ten-fold in a few years. Its trains could reach Riverside sooner than the street cars can reach Union Park, and it might reasonably expect to have an almost continuous village along its line from the city limits to Naperville. Evidently the railroad companies will join heartily with the city in an effort to obviate the evils of crossings at grade.

The companies have proposed a series of viaducts to to be carried over the railroads. These, of course, are not novel. There are already in the city several, erected for a similar purpose, some of which have been in use for years. Heretofore, however, most of them have been located over tracks near the bank of the river, and formed, in reality, continuations of the river bridges, being very nearly on the same grade with those bridges. Such are the viaducts at Madison, Randolph, Lake, Wells, and State streets. The only change in the street made necessary by these viaducts is the beginning of the incline at a point somewhat further from the river bridge. The viaducts lately constructed over Halsted steeet have been under different circumstances, and these have made necessary a change in the grade of the street for a great part of two blocks, in order to provide inclined planes as approaches to the viaducts. Here, however, the track is on the natural surface of the ground, while the grade of the street is considerably above it; consequently the necessary elevation to surmount the viaduct has not been so great.

It is proposed now to construct viaducts over the track of the Chicago, Burlington & Quincy Railroad, on Wabash and Michigan avenues. This proposition for relief, met favorably elsewhere, receives a bitter opposition from property holders on these avenues.

The objections urged are the great injury to the property in front of the incline, and the obstruction to the vista up and down the streets which would be caused by an elevation at this point. It is said that the beauty of these fine streets would be greatly injured by the construction of the proposed viaducts. However, in the discussion occasioned by the proposition, not a few of its opponents seem to have let their angry passions rise, and resolutions were passed at one meeting which stated as "the general opinion," that viaducts would be more dangerous than crossings at grade, and asked that the city require the railroad company to move its cars with horses instead of locomotives.

Now nothing is to be gained by discussing this question with temper—except a great increase of an already too prevalent ill feeling. The rights of both parties, the facts in the case, and the probable effects of proposed improvements are questions which should be settled, but which some settle for themselves seemingly without consulting the other party.

In the first place railroad companies and citizens will agree that something must be done. Both will agree in condemning the present crossings at grade, at least so long as the present frequent movement of trains continues. What, then shall be done?

The only definite proposition, so far as we know, is that of the railroad company, to build viaducts. The opposition presents no means of relief as yet, unless we accept the demand for an abolition of the locomotive on that part of the line as intended as a measure of relief. Probably a single day's experience with horses would settle this question. Those who object to the obstacle presented by trains of cars at short intervals, would hardly find relief in an almost uninterrupted succession of short trains moving slowly. It would be jumping out of the frying pan into the fire. Those who suggest that the trains might enter the city somewhere else should bear in mind that the railroad company has rights as well as the real estate holders, and that it is not likely to give up its road for the benefit of the resident, any more than the resident is likely to give up his house for the benefit of the railroad company. The business of the railroad has grown, to the detriment of the residents on the street, and the movement on the street has increased to the detriment of the business of the railroad. Purchasers of lots on the avenue bought property to which the injury occasioned by the railroad crossing attached. To ask that the railroad company should remove that crossing is to ask that it should improve their property for their benefit at its expense, which, we fear, no railroad company is likely to do.

But the property owners have rights; and the railroad companies should consider carefully their views of the question. Exception has been taken to the assertion that viaducts would injure the beauty of the avenues; and some, arguing in favor of the railroad company's proposition, have affirmed that these structures would be ornaments and not deformities. Now in this matter only the opinion of the residents on the avenue is worth considering. *It is their street*, and their ideas of beauty must be accepted in treating it. If *they* object to its ornamentation, that is enough. No other party or parties should be permitted to dictate as to the ornamentation of their property. It is all very well to try to convince them, but not to force your æsthetic ideas upon them.

The plan proposed by the railroad company is not at all like those of other viaducts in the city. Indeed, it is rather a compromise between a viaduct and a sunken way, than a viaduct pure and simple. The track is to be laid in a cut nine feet below the surface of the street. This simplifies the problem immediately. The height of the viaduct above the street, and the length of the inclined planes which will form approaches of the viaduct will be only about half as great as would be necessary if the track were on the street grade, as now. As a rise of one in twenty is as much as is required in the approaches, they would be each about two hundred feet long, on the south side reaching as far south as Sixteenth street. At the viaduct the elevation would be about ten feet above the street grade, so the first lot would have its front obstructed to that height; the second, 8¾ feet; the third 7½ feet; the fourth 6¼ feet; the fifth 5 feet, etc., and the damage to the property would be somewhat in proportion to the height of the viaduct in front of it. The lower floor of these houses would doubtless be less desirable than that of other houses. Property in this vicinity is valued at from $300 to $400 per foot. All the property fronting the approaches would have a front of about 800 feet, so we may reckon the value of the property injured at something like $300,000. What the per centage of injury would be, every one may estimate for himself; but we venture to say that the whole value of the property is less than the value of the improvement to the city and the railroad companies.

We give elsewhere a plan for a viaduct which would not obstruct the view up and down the avenue, and which would occupy comparatively a small part of the avenue front. For these beautiful streets an exceptional expenditure might well be permitted.

It is necessary, however, to adopt some policy which will serve not only in this case, but in all other cases. Wabash and Michigan avenues are not the only streets in the city which the railroads have to cross. Already in many other streets the crossings at grade are very troublesome. The business of the railroads and the traffic on the streets increases rapidly and constantly. There are now six main lines of entrance into the city, and there may be more; for this city has not required that any road should permit any other line to enter on its route. To build viaducts at all crossings will require an expenditure of millions. Yet year after year new ones are required, and it is not safe to say that the most distant streets will not demand them eventually. Moreover, the crossings at grade may occasion a vast injury to property which is not evident. We can easily see how a fine street is injured by the frequent crossing of trains, but it is not easy to say how many fine streets would have been but for these crossings. Who can say that the West Side for a mile north of Lake street might not have been as well built and as valuable as the West Side for a mile south of the same street, but for the tracks on Kinzie street?

It is easier to show how the present evils might have been prevented than to offer an effectual remedy for them now that they have become so serious. A deep cut, extending from a point near the confluence of the North and South branches, and extending westward, wide enough to contain tracks for all the roads entering the city, and so deep that the street travel might cross it on bridges at grade, might have afforded an entrance into the city nearly as much out of the way as a tunnel, and, for all the roads, not costly. It could have been (and, if we are not mistaken, it can be now) adapted to the sewerage system of the city, and it could have received tracks on the surface running along the river and its branches, for the accommodation of the lumber, coal, grain, provisions, iron, and other heavy traffic. As it is, we are not sure that the Chicago & Northwestern Railway will not yet find it advantageous to adopt this or some similar plan for at least a part of the route out of the city. But we can hardly expect other lines to be admitted to its advantages, unless, at some future day, when consolidations shall have been carried to the utmost, all the lines entering the city shall be controlled by a single association.

But it is idle to speculate on what might have been, so we will leave that to Maud Muller, and commend our experience to the young towns of the West which are to be the Chicagos of the future. The question with us is, What shall be done? Costly plans may do for Michigan and Wabash avenues, but we need a system for the city. The crossings are so numerous that cheapness will be one of the most desirable qualities. How shall we put our railroads over or under our streets? This is now Chicago's great problem in engineering. The city which has solved with such boldness, originality and

success the problems of water supply and river crossings, may, we hope, have equal success in preventing the interference of the traffic of its railroads and the traffic of its streets.

MODIFICATIONS OF THE LEASE OF THE PHILADELPHIA & ERIE RAILROAD.

Some modifications of the lease of the Philadelphia & Erie Railroad by the Pennsylvania Railroad Company have been proposed by the latter company and are likely to be adopted. By these modifications the Pennsylvania company is to receive the gross receipts of the Philadelphia & Erie Railroad, to be applied as follows: 1. To the payment of the expenses of the operation and maintenance of the road and rolling stock, including an allowance of not more than 7 per cent. on all capital invested in supplies and rolling stock required for the business of the road, premium for first insurance, and taxes and assessments by Pennsylvania or the United States. 2. The cost of maintaining the legal organization of the Philadelphia & Erie Company, including office rents. 3. Payment of interest on the Philadelphia & Erie mortgage bonds, and the installments of the sinking funds heretofore provided. 4. Payments of the surplus to the Treasurer of the Philadelphia & Erie Company, less such amounts as may have been advanced to it by the Pennsylvania Company. 5. If the surplus of gross receipts shall prove insufficient to meet all these payments, then the Pennsylvania Company is to apply whatever residue remains after paying the expenses of operation and maintenance on account of the interest of bonds, according to their several priorities.

6. The Pennsylvania Company is not to be liable to pay, in consequence of any deficiency of gross receipts, for any of the purposes to which it is agreed that the surplus of gross receipts shall be applied as aforesaid.

At a meeting of a committee of the Philadelphia Common Council, called to discuss the propriety of instructing the city directors of the Philadelphia & Erie Company to vote in favor of these proposed modifications, Col. Thomas A. Scott, First Vice President of the Pennsylvania Company, explained their object as follows:

"The main object of the modification is that the net earnings shall be given to the stockholders of the Philadelphia & Erie Railroad Company. Freights that pay but five or ten per cent. we cannot afford to carry, and yet appropriate 30 per cent. to the Erie road, as under the original lease. Neither the Pennsylvania Railroad nor the Philadelphia & Erie Railroad derive any benefit from the old lease, but we think that if the freight of the Philadelphia & Erie Railroad could be carried as we do that of the Pennsylvania Railroad Company, it would be advantageous to both, and the stockholders would be gainers in the increased business expected in the future."

In reply to a member who asked if the Pennsylvania Railroad had capacity for the increased business expected, Col. Scott said:

"Oh yes, capacity for three times the amount of business we now have. But to develop the business of the Erie Railroad at five per cent., and pay 30 per cent., is what we cannot consent to do. I believe the present arrangement will in time build up a remunerative traffic. During the war we lost money, owing to the high prices for labor, materials, etc., and one year it reached $170,000, and last year it was $61,000. This year, I think, we will be about even, and we wish now to develop the region through which the Philadelphia & Erie Railroad passes, and this modification of the lease, we believe, will accomplish that object, and result in a benefit to the stockholders of the Philadelphia & Erie Railroad, and, of course, the city. All we ask is the working expenses of the line. We propose to furnish the equipment and money for the road at a cost not exceeding 7 per cent.

"The stockholders of the Pennsylvania Railroad are a majority in the Erie road, and are deeply interested in the issue, and will do nothing to affect the prosperity of either. All we seek is to give to the Philadelphia & Erie Railroad the greatest facilities for the improvement of the country through which the road passes, and we believe that within three or four years we can accomplish the work. But we cannot develop this large region by paying 30 per cent. I think it is the interest of the city of Philadelphia, the State of Pennsylvania, and the interest of the stockholders to agree to this modification."

The city directors were instructed to vote in favor of the modifications of the lease, and hereafter, doubtless, the Pennsylvania Company will report no losses in operating its Erie branch.

An article in the last number of the RAILROAD GAZETTE headed "The Canada Southern Railway," on page 365, should have been credited to *Herapath's Railway Journal*.

FREE PASSES IN ENGLAND.

We took occasion, a short time ago, to make some comments on the abuses of the free pass system in this country. We then intimated that the day might come when those who ask—and not infrequently receive—free passes for themselves, their families and their friends, might find it difficult to procure them for themselves alone. Since that time we have seen in an English railroad journal a letter from an English stockholder, with some editorial comments, which indicate the present English practice. The correspondent complains that army officers were traveling at reduced rates on their way to the Derby races, and says: "Surely, sir, this cannot be right. Here was I, a shareholder of very long standing in the three railway companies existing between Plymouth and London, traveling to town expressly on matters connected with the amalgamation scheme of the preferential stocks of the Great Western Railway, both parties having paid about the same, thrust into a second-class carriage, whilst these other gentlemen, in no way interested in the railway, but traveling solely for their own pleasure, sat luxuriating in a first-class."

The editor in commenting on this letter says:

"The press have no free passes; railway proprietors are compelled to pay full fares, even when traveling on their own lines; impoverished by parliamentary burdens the companies are struggling to earn dividends which barely amount to the common rate of interest for money, yet officers in the army and navy are carried at reduced fares!"

Our railroads are not as yet operated so closely as the English lines; but we may be sure that the time has come when economical reforms are looked upon with favor, and every year we may expect abuses to be discovered and abated. A full statement of all the passengers carried free in one year on some of our leading lines would, we fear, cause stockholders and managers to use heroic remedies, anything but pleasant to the recipients of free passes. Those who wish the system to be continued, can do much towards it, simply by moderation in their requests.

Temperance now may prevent a prohibitory law hereafter.

Liability for Damages for Stock Killed on Depot Grounds.

The following is the opinion of the Supreme Court of Iowa (reported 26 Iowa, 549,) in the case of Davis *vs.* the Burlington & Missouri River Railroad Company, in which suit was brought to recover damages for a cow struck and killed by the company's locomotive on its depot grounds in Mt. Pleasant, Iowa, an incorporated city. By the laws of Iowa, railroad companies are not required to fence their tracks, but unless they fence are required to pay double the value of all stock killed by their trains, whether through negligence or not. As the court put it: "Generally we may state the liability of "the company, in relation to stock killed, as follows: If "killed where there is the right to fence and none has "been erected, the liability is absolute. If there be a "fence, gross negligence must be shown on the part of "the company. If the killing takes place where there "is no right to fence, the company is held to reasonable "care and liable for ordinary negligence."

The question presented in this case was defined as follows:

"But the main question in the case relates to the defendant's liability, without reference to the question of negligence. These grounds were not fenced. If a company fails to fence its road against live stock at all points where it has a right to fence, it becomes absolutely liable to the owner of any stock injured, etc., and in such cases it is only necessary to prove the injury complained of, etc. Laws of 1862, ch. 169, § 6. And hence the very point here made is that the statute extends to depot grounds, and, indeed, to the entire line of the road. Whether it does, we are now called upon for the first time to determine in this State."

The Court then declared that there could be no dispute as to the liability of the company because of any hardship or apparent unreasonableness in the requirement to fence, but that it must be liable if only it has the right to fence. The intention of the law-giver, however, will determine whether the law requires the fencing of depot grounds across numerous streets, so as to obstruct communication with the stations and grounds where cars are loaded and unloaded. The Court held that it was its duty to ascertain whether in the particular case it was fit, proper and suitable that a fence should be built. In pursuance of that duty it decided that the law was not intended to apply to depot grounds, but particularly to agricultural districts to protect the stock running at large and liable to be killed where the railroads are not fenced.

"To make the requirement to fence imperative, it was doubtless thought, would unnecessarily fetter the energies of these companies, at a time when their roads were needed for more rapid growth of the State. And at the same time stock owners were protected in their rights, when the injury was occasioned by want of a fence. This was a compromise, so to speak, between the imperative rule of some of the older States, affirmatively requiring a fence, and that of the common law which makes cattle trespassers if found on the track, whether fenced or not. The thought, however, was the fencing of the track or road, and not the depot grounds."

The Court was strengthened in this conclusion by the fact that in many cases depot grounds extend across streets, which, of course, they cannot fence across; while, if only the intervening space should be fenced, those streets would give access to the fenced portion of the grounds, the law not requiring cattle guards at crossings. The decision is not based on any real or supposed inconvenience to the company, but the Court founds it on "the public convenience, the public interest, the spirit and policy of the statute the mischief to be remedied, as well as the words employed to express the legislative will."

A New Texas Port.

A place called "Saluria," at the eastern end of Matagorda Island and on the west side of the entrance to Matagorda Bay, puts forth claims to be the future great port of Texas, especially as against Galveston. It seems that neither Saluria nor Galveston have harbors which are worth much, the best having only ten feet over the bar. But the Salurians claim that by cutting a channel through their bar a short distance a good and permanent harbor will be made; and that the sand would fill up a channel to Galveston as fast as it could be dug out, and probably faster. Galveston has the railroads, which Saluria claims to be a great mistake on their part. Saluria is nearly due south of Preston, on the Red river, where a railroad from Kansas across the Indian Territory is expected to cross. It is about fifteen miles from Indianola, which is the present southern terminus of the San Antonio & Mexican Gulf Railroad, a line in very dubious condition lately sold to Charles Morgan and others, who it is said, propose to extend the road at some time to Austin. There are two harbors north of Saluria, Indianola and Port Lavaca, and it is presumable that both claim advantages over the lower town, as they now are, without doubt, more thriving towns, though all have a great deal to do before they can become of much importance. The railroads of Texas now built and in the course of construction have their natural outlet at Galveston, if in Texas at all, it being probable that a railroad from New Orleans, when built, will take a large share of their traffic. Such freights as cotton are not always taken to the nearest seaport, as large shipments made from Vicksburg and Jackson, Miss., by rail to Savannah, sufficiently prove. If the price of this staple should decline to something like *ante bellum* figures then the freights would become a more important item.

REGISTER OF EARNINGS.

FOR THE FIRST WEEK IN JULY.

Michigan Central, (424 miles) 1870	$74,979 60
" " (329 miles) 1869	72 266 72
Increase (3¾ per cent.)	$2,712 88
Chicago, Rock Island & Pacific (608 miles) 1870	$147,3 0
" " (594 miles) 1869	134,495
Increase (9½ per cent.)	$12,805
Milwaukee & St Paul, (936 miles) 1870	$174.463
" " (825 miles) 1869	148,711
Increase (17½ per cent.)	$25,752
Pacific of Missouri, (355 miles) 1870	$52,752
" " (355 miles) 1869	46,087
Increase (14½ per cent.)	$6,665

FOR THE SECOND WEEK IN JULY.

Michigan Central, (424 miles) 1870	$64,903 19
" " (329 miles) 1 69	63,317 25
Increase (2½ per cent.)	$1,685 94
Chicago & Alton (465 miles) 1870	$106 747 67
" " (431 miles) 1869	88,889 93
Increase (20.1 per cent.)	$17,857 74

—Howard & Weston have commenced suit against the Lafayette, Bloomington & Mississippi Railway Company, claiming $300,000 for work done and damages. They had the contract for constructing the road and commenced the work, but it was afterwards taken from them and put in other hands.

Cairo & Vincennes.

Arrangements have been made for the resumption of work on the Cairo & Vincennes Railroad and unless some unforseen difficulty arises the work will be constructed rapidly. Gen. Burnside, the President continues at the head of the enterprise. Dewey & Mitchell have contracted to grade 60 miles when the work is resumed.

Chicago Railroad News.

Chicago & Alton.

The high prices of grain occasioned by the impending European war have stimulated shipments on this line. The earnings for the second week of July show an increase of more than 20 per cent., and now, at last, the earnings for the year since the first of January are larger than for the last year.

The Bloomington *Leader* of late date says:

"The Chicago & Alton Railroad Company have received one of their new passenger coaches, which has just been placed on the line. It is one of the most convenient in construction, and elegant in upholstery and finish, that has been seen in the Western country. They have ten more of the same kind under contract, which, when completed, will make the Chicago & Alton road the completest and most regal in style of its passenger accommodations, of any road in the United States."

Chicago & Northwestern.

This week a party of twelve engineers was sent to Madison to commence the survey of the "Baraboo Air Line Railroad," by which this company intends to connect Madison and Winona.

The company is soon to commence the construction of an elevator at Council Bluffs, especially to receive and transfer grain brought to that point by steamboats on the Missouri.

The office of General Master Mechanic, which has been held for many years by Horatio Anderson, has been abolished. There are now only master mechanics of divisions, all responsible, we believe, to the General Manager.

A considerable increase in the earnings of the road may be expected soon, as the war prices of grain are likely to bring forward last year's crop, much of which still remains behind, very rapidly.

Chicago, Burlington & Quincy.

The Riverside business is one of the peculiar developments of the present season. Since about the 5th of May 17,800 contractors' tickets have been sold, for the transportation of laborers on the improvements to and from the city. In this month alone 4,000 such tickets have been sold.

Pittsburgh, Fort Wayne & Chicago.

The shops at Fort Wayne are fully employed in work for this road, and also in the construction of Pullman Palace cars and rolling stock for the Indianapolis & St. Louis and the Grand Rapids & Indiana roads. Several new Pullman cars of the most elegant pattern have been completed for the fast train between Chicago and New York, which leaves this city at 11 o'clock a. m.

Illinois Central.

There have been built recently at the company's shops in this city, two new sleeping coaches, which, for comfort and convenience, are not easily surpassed, and which are really elegant, though there is less display than in many coaches built of late years. These cars are called the "Black Hawk" and "Sioux City." They are neatly painted on the outside, with black walnut doors. The interior finish is in polished black walnut, with little carving or other ornament. The upholstery is rich and elegant, and not to be surpassed for comfort. The berths are made to turn up more nearly perpendicular than usual, giving a broader space under the elevated roof, and making the car roomier and lighter. These berths are suspended by a peculiar apparatus (Snow's spring counterbalance), by which they are wound up with the greatest ease, and may be suspended at any angle without danger of falling. At each end there is a large wash-room, each provided with *two* basins, so that passengers can make their toilets with little delay in waiting for each other. There is also a state-room at each end. The windows are higher than usual, so as to give light to the upper births, which is certainly a desideratum. Three more sleeping cars similar to these will soon be put on the road.

The Iowa division of this road now makes connections at Fort Dodge with a train on the newly completed line between Fort Dodge and Sioux City, which the contractors are running. This is a mixed train, carrying both passengers and freight. It leaves Fort Dodge 9 o'clock a. m., and reaches Sioux City at 7 o'clock p. m. Going east it leaves Sioux City at 6 o'clock a. m. and arrives at Fort Dodge at 3:30 p. m. This train gives access to the fine country in Calhoun, Pocahontas, Buena Vista, Cherokee and Plymouth counties, and passes through the towns of Storm Lake, Cherokee, Lemars, and Melbourne. Officers of the Illinois Central are now inspecting the new road, and when it is fully completed they will accept it and commence its operation, running trains through from Dubuque—perhaps from Chicago—to Sioux City. This great increase in its Iowa lines increases the necessity for a short route of its own between Dubuque and Chicago.

Indianapolis, Bloomington & Western.

The Peoria *Review* says: "We hear that the Indianapolis, Bloomington & Western Railroad Company, failing to make satisfactory arrangements with the Peoria, Pekin & Jacksonville Railroad for running into this city from Pekin, have determined on building an independent line to Peoria. They propose to bridge the Illinois just below the Peoria, Pekin & Jacksonville bridge at Pekin, and then run up until they strike the Chicago, Burlington & Quincy road, and run into the city on the track of that company."

Mississippi River Railroad Company.

This was organized four years ago for the purpose of building a railroad from Memphis northward a few miles west of the bank of the Mississippi River to a point opposite Cairo, a distance of 151 miles, 110 of which are in Tennessee. There will be a branch six miles long from Troy, Tenn., to Troy Station, where connection will be made with Paducah, affording a very direct route between Memphis and Paducah.

It was originally expected that the company would receive State aid in Tennessee amounting to $10,000 per mile, with $200,000 for county subscriptions to the amount of $650,000, $110,000 of private subscription, and a conditional subscription of $50,000 from Union City, Tenn. These subscriptions would have built the 110 miles of road in Tennessee, for which they were made. But the State aid became unavailable before the company was prepared to claim it, as its bonds would barely yield 50 cents on the dollar and would be a first mortgage on the road, rendering it difficult to negotiate a second mortgage. Some private subscriptions also were relinquished, and county subscriptions are left as the main basis for commencing the construction of the road.

Arrangements have been made with capitalists interested in the Pennsylvania Railroad Company for the construction of the road, which make it probable that the road, when completed will be operated in connection with that company's lines, (of which the Cairo & Vincennes Railroad is one) and will form its line to Memphis. It will also form the shortest line from Chicago and St. Louis to Memphis:

We copy the following from the report of the President, A. S. Mitchell, recently published:

Although this company did not have, until last July, any available resources, yet the work of engineering had been commenced more than a year previously, under the direction of Thomas H. Millington, a civil engineer of experience and ability. Captain Millington performed in the early part of the year 1868, a large amount of work on the upper portion of our line, extending through the counties of Obion and Dyer, and had located six miles of road and prepared it for letting. But upon receiving the liberal subscriptions of Shelby and Tipton counties, it was deemed proper to transfer operations to this end of the line and prepare the road for contract between Memphis and Covington.

* * * * * * *

In the making of his surveys for the Mississippi River Railroad, the Chief Engineer received only two instructions from the directors: 1. To make it as nearly an air line route as practicable. 2. To omit no care, pains or expense in preliminary surveys, so as to be absolutely sure of making no mistake in location. We believe this work has been conscientiously done, and that Memphis will have one road at least, that has not been swerved one inch to the right or left to serve individual or neighborhood interests. As one evidence of the fidelity of the Engineer to his instructions, we can state that the line as building from Memphis to Covington, a distance of 36½ miles, does not exceed the air line between those points over 726 feet; and the entire line of 108 miles to Troy Station in Obion county, possesses 84 per cent. of air line. This directness of line, with the low maximum grade of only fifty feet to the mile, will enable the Mississippi River Railroad to run trains safely at a higher rate of speed than can be obtained by any other road in the State.

The elaborate surveys the directors ordered, in order to attain these results necessarily run up a large aggregate for engineering expenses. But, believing that such careful, thorough surveys are the best investments ever made when a railroad for perpetual service is to be built, your directors have nothing to qualify or regret in the expenditures thus incurred. What may seem to be extravagant at first will prove to be the truest economy in the end.

The surveys and location from Memphis to Covington having been completed, on the 20th of September, 1869, a contract was entered into with G. W. Saulpaw & Co. for executing the clearing, graduation, masonry, bridging and all other work required in preparing the roadbed for the iron rails; the work to be completed on or before the first day of February, 1871. The contractors began work in October; but, in order to protect the company against embarrassment in case the directors should experience any difficulty in negotiating the county bonds on which they relied to raise money, the contractors were restricted at the start to an expenditure not exceeding $8,000 per month. They were authorized however, in November, to increase their force to 300 men, which force it was calculated would increase the monthly estimates to $10,000. But the winter proved so open and so favorable to work that the estimates considerably exceeded these figures.

Being desirous to expedite matters and hasten the completion of the entire road by enlisting foreign capital, the Board of Directors, through the Executive Committee in December, after some preliminary negotiations, came to a definite agreement with an association of eastern capitalists to build and equip the entire line of their road from Memphis to a connection with the Mobile & Ohio road and the Paducah & Gulf road, in Obion county, a distance of 102 miles. These capitalists—of whose ability to perform their undertakings there is no doubt—agreed on their part, to take our subscriptions as made and to be made, to become themselves subscribers for $1,000,000 of stock, and to buy the first mortgage bonds of the company at eighty (80) cents on the dollar, and on this basis to advance the money needed to build and equip the road according to the specifications of our Chief Engineer.

The first striking fact of this proposition is, that by it our first mortgage bonds are made to yield thirty (30) cents in the dollar more than the State bonds would have yielded us. In other words, the credit of our road is thirty (30) cents in the dollar better than the credit of the State. The second fact is, that our counties will get the road by paying in cash not much, if any, exceeding 22 per cent. of its cost. The third fact is, that the connections north and south of us, afforded by roads that are controlled by the parties uniting with us, are of incalculable advantage to our road, in making it a link in the great highway over which the tide of trade and travel must forever roll, each year in increasing volume, north and south throughout the entire length of the Mississippi Valley. The alliance of these railroad lines, which our negotiations have initiated, is a commercial necessity, and the sooner it is consummated the greater will be the efficiency and economy of their operation and the greater the benefit and convenience of the people interested and expecting to use them.

The agreement with these eastern capitalists, although reduced to writing and deposited in the hands of a third party, has not been finally executed, owing to hindrances on their part that could not well be avoided; yet they expressed a readiness to advance money to the directors at the rate of $10,000 per month, to enable them to continue work on the road. And the Board of Directors by a formal resolution, adopted December 30, 1869, authorized the Executive Committee to use the county bonds in furtherence of the interests of the road and to perfect the negotiations with these parties. Accordingly part of the bonds have been withdrawn by the committee and used as collaterals to secure the money thus advanced by our eastern friends.* The rest were placed as a special deposit in the Merchants National Bank, to secure advances obtained from that bank and from other moneyed institutions in Memphis, and to await redemption by the counties.

The entire amount paid by the counties of Shelby, Tipton and Lauderdale, and by individual stockholders in Dyer and Obion counties, to date, is as follows: Tipton county—Bonds redeemed, $22,000; coupons for interest, $12,000; total from Tipton county, $34,000. Shelby county—Coupons for interest, $18,000. Private stock in Obion county, $1,262; in Dyer county, $305; advances on Lauderdale county subscription, $1,500. Total receipts from subscriptions, $55,067. Of the $500,000 of county bonds delivered to this company, only $22,000 (Tipton county bonds) have been redeemed, leaving in the hands of the company $178,000 of Tipton county bonds and the entire amount ($300,000) of Shelby county bonds unused and certain to be applied to the building of the road. The reason of the small amount collected from Shelby county to date, is the well known fact that the tax books of Shelby county were withheld from the collector until after the beginning of the present year, whereby the season most favorable for the collection of taxes was lost.

While the receipts of the company from the sources named have only been $55,067, the total amount of expenditures to date, incidental to construction, is, approximately, $159,185.15, under the following heads, to-wit:

Grubbing, graduation, masonry, etc.	$99,540 00
Engineering, right of way, instruments and office expenses.	37,807 90
Contingent expenses, salaries, printing, stationery, from August 14, 1866, to date	21,736 35
	$159,135 15

The cost of engineering proper, is about $30,000, including all work done since the reorganization of the company. This covers several hundred miles of preliminary surveys and about seventy (70) miles of located line. The cost is not high, in view of the very thorough and exhaustive character of the surveys that were made. The facts will fully appear in the report of Captain Millington, one of which is, that in order to overcome the difficult topography of Lauderdale county, and locate the best line, one hundred and fifteen (115) miles of preliminary surveys were run.

But the directors repeat that this large expenditure on surveys is the truest economy, as it has furnished a line of road in grade and alignment superior to any in the State, and must make the Mississippi River Railroad forever pre eminently the public favorite, for its superior speed and power of work.

*Under the agreement above set forth with McComb and associates, the Mississippi River Railroad Company had, up to May 31st (the date of this report), received from McComb & Co. about $76,000, secured on county bonds held by the company. On the 31st May, according to this agreement, these parties presented a subscription of $1,000,000 in the name of J. K. Porter, guaranteed by the Southern Railroad Association, according to the terms of the written agreement aforesaid, and assigned $50,000 of the amount that had already been advanced to the Mississippi River Railroad Company, as a payment of 5 per cent. on said subscription. This, of course, reduced the indebtedness of the Mississippi River Railroad Company to McComb and Associates to about $26,000, and released a proportionate amount of county bonds from their hypothecation with McComb & Co. to secure the advances they had made.

Honduras Oceanic Railway.

We have to announce a further addition to the successful issues of loans for the construction of railways in foreign countries. For some time past it has been matter of surprise to those who have watched the progress of financial affairs, that foreign loans should be subscribed in the country with so much facility. Two reasons are generally put forward to account for this readiness on the part of the English capitalist to part with his money: they are the low rate of money at home, and the higher rate offered by the borrowers. There is a third point which appears to be too much lost sight of, and that is the faith which the capitalist has in the value of the security offered by productive works, and especially by railways. It is this security which has enabled Russia to appear so frequently in the market as a borrower, and without injury to its credit or reputation. One great

cause of the apparent success of the Peruvian Government in obtaining its fresh loan of £12,000,000 was the promise held out that it would be expended in the making of two important lines of railway. Turkey, Egypt, Spain, Portugal—any country, in short may obtain money if they will only give an assurance that it will be properly and economically applied to the making of railways. It is not alone that railways possess in themselves the means of earning money and providing a security for the punctual discharge of obligations on the part of the borrowers, but they also, by developing the resources of the districts through which they pass, create wealth and enable the community to contribute more largely to the revenues of the States which are wise enough to aid in their construction. South America affords at least one notable instance of the value of railways in advancing the prosperity of a country. Buenos Ayres has a railway which was built with money raised in this country on the guarantee of the Government. That railway—the Southern of Buenos Ayres—now earns more than sufficient to cover the guarantee of the Government, and the company by whom it was made have consented to relieve the Government from all liability in regard to the work. With such a state of things as this, with its credit thus greatly improved, it need not excite surprise to find that the credit of the Government of Buenos Ayres is so good that it has readily obtained another loan of about £1,250,000 during the week.

But a still more remarkable illustration of the value which capitalists attach to railways as a source of investment is afforded by the success which has attended the issue of the loan for the completion of the Honduras Railway. Of the Republic of Honduras but little is known in this country, and with every possible respect for the country which is so efficiently represented here by His Excellency Senor Gutierrez, we are fully confident that but for the purpose of making a railway across the country, he would have applied in vain to the money markets of this or of any other country for that further loan of £2,500,000 which has been so successfully placed by Messrs. Bischoffsheim during the past week. The public have every confidence in the good faith and the honesty of purpose of the Government of Honduras, but what they rely upon for the payment of the 10 per cent. and the redemption of the bonds at par in fifteen years, are the earnings of the road, which is to form the great highway between the Atlantic and the Pacific. We have passed the time when the greatness of an enterprise offered any insuperable bar to its accomplishment. The Isthmus of Suez has been pierced, the continent of North America has been traversed, and the narrow neck that joins the continents of North and South America has its Panama Railway in active operation. Few works of modern times have been completed under greater discouragement, or caused greater discomfort and vexation to those who have had occasion to travel upon it, than this famous Panama Railway. This line was built exclusively with American capital, supplied mainly by Mr. Aspinwall, of New York. It was commenced in 1848, and seven years were occupied in the construction of its forty-eight miles of road, the cost being about £32,000 per mile. Over and over again the work was stopped by the terrible malaria and pestilent fever-breeding air, which poisoned all who breathed it. The natives of the country, West Indian, Irish, French, German, Coolies, and Chinese—all were tried, and thousands of men perished in the attempt, until the whole road was ridged with their graves, and it was found when all was done that for every timber sleeper that was laid, one man slept the long sleep in this pestilent country. The men who supplied the smallest proportion to the death lists were the negroes from Jamaica and the white laborers from the Northern United States. Of the Atlantic terminus of this road, named after the great capitalist who owns so large a portion of it, the New York *Tribune* says:

"Aspinwall owes its birth to the Panama Railroad, and was surely born too soon—sent to this breathing world scarce half made up. Surrounded and intersected by stagnant pools, water unfit for drinking or cooking without distillation, air close and malarious, and population hybrid, it is the dreariest, wretchedest, most repulsive city of fact or fiction, not excepting Cairo in the days of Martin Chuzzlewit."

As it is the most unhealthy, so is it at the same time the one railway which charges the highest fares and pays the biggest dividends of any in the world. The charge for passengers is little short of a dollar per mile. Think of this, ye friends of the working men, who are urging upon railway companies the propriety of carrying the favored class at a penny per mile, with unlimited claims for compensation against the companies in the event of accident! Is it a wonder, then, that with all the greatly increased amount of travel between this country, its Australian possessions, and its rapidly advancing colony of British Columbia, on the Pacific, we should require some means of traveling more in accordance with the wants of the present day, and that we should not be dependent entirely upon America for our passage across the Isthmus? The line, which has been for some time in progress through the State of Honduras, will not only provide a much better route for the trade between England and the Pacific, but it will shorten the distance between New York and San Francisco by not less than 1,300 miles, effect a proportionate reduction in the voyage from England to British Columbia, and greatly abridge the time and distance between England and Australia, by cutting off the voyage round Cape Horn. The railway is about 200 miles in length, having its Atlantic terminus at Puerta Cabella, and on the Bay of Foncesca on the Pacific. The country traversed differs in every essential feature from that through which the Panama line passes. Its climate is healthy, the soil rich and fertile, it has enormous trunks of forest timber, and there are indications in many parts of rich mineral ores. The loan just obtained is sufficient to complete the road from the Atlantic to the Pacific, and to place it in thorough and efficient working order. The contractors for the line are Messrs. Waring Bros.—in themselves a guarantee for efficient construction of the railway—and they bind themselves under heavy penalties, though with such a firm penalties are wholly unnecessary as a protection for the fulfilment of promises—to complete and deliver over the work in the autumn of 1872. The first section of the line is to be finished in November of the present year. In order to ensure the proper appropriation of the money now raised, the proceeds of the loan are paid into the the hands of trustees, who also hold for the benefit of the bondholders a mortgage of the entire railway, and will receive the proceeds of the sale of the State domains and the timber specially hypothecated for the purpose of the loan.

One very important feature in connection with the road is the guarantee of its neutrality by the British, French, United States, and Honduras Governments. The British Government not only recognizes the rights of sovereignty and property of Honduras in and over the line of the road, but it also "guarantees positively and efficaciously the entire neutrality of the same." "And when the proposed road"—to quote the words of the treaty—"shall have been completed, her Britannic Majesty equally engages, in connection with the Republic of Honduras, to protect the same from interruption, seizure, or unjust confiscation from whatsoever quarter the attempt may proceed." There can be no doubt of the enormous benefit which the construction of this railway across the State of Honduras will confer upon the commerce of the world, and possessing, as it will do, so many points of superiority over the existing Panama route, it cannot fail to attract to itself a very large amount of Transcontinental traffic.

Compensation for Railway Accidents.

The deplorable accident which has just occurred on the Great Northern Railway, and the evidence now being given before the committee of the House of Commons, have again directed very general attention to the present state of the law as affecting compensation for railway accidents. The lamentable occurrence at Newark has shown—so far at least as the facts are at present known—what every person conversant with the working of railways must know, that there are occasions upon which, from no default whatever of management, accidents involving serious loss of life and property may occur. We perceive that even those of our daily contemporaries who are always most on the alert to find fault with, or to write sensation articles about, railway accidents, have confessed that in this case, at least, there appears to be no blame fairly attaching to the directors of the Great Northern Railway. Some attempts have, it is true, been made to connect the accident with the system of excursion trains; and the opinion of Dr. Lardner has been cited by one of our contemporaries against the system. Considering that this same authority, some years since, proved to demonstration that a steamer could not possibly cross the Atlantic, too much importance should not be attached to any opinion coming from that quarter. It is well, however, to hear what so great an authority may say on the subject. In one of the chapters in his "Museum of Science and Art," headed "Plain Rules for Railway Travelers to Avoid Accidents," Dr. Lardner states that statistics had satisfied him that excursion trains and special trains were exceptionally liable to casualties. "Excursion trains," he says, "are exceptional, but not unforeseen, and are not, therefore, as unsafe as special trains. They are, nevertheless, to be avoided by those who scrupulously consult their safety." We venture to doubt the accuracy of the comparison drawn as between special and excursion trains, but we are prepared to admit that trains of this kind do add very considerably to the risk and danger of railway traveling. We have considerable doubt, too, whether they add anything to the revenues of our railway companies. Exceptional fares—whether for the so-called working-man or excursionists, are based upon a wrong principle, and we believe that the managers of our railways would do well to consider whether some plan might not be devised for putting an end to excursion trains altogether, while, at the same time, affording all necessary facilities for the public. If it is not possible at the present time to reduce all the fares to the average of excursion rates, something in the way of a compromise might be tried, by fixing low rates of fares to one or more particular trains on some specified day, admitting, in fact, excursion rates by ordinary trains. If it should be objected that it would be unfair to passengers by ordinary trains at other times and days that they should have to pay a higher rate than by the favored ordinary, it would be replied that the present system is equally unfair. An ordinary passenger train leaves, say at six o'clock in the morning, the excursion train an hour after, and those who travel by the ordinary train have the mortification of finding themselves shunted in order to let the quick and exceptional train of excursionists pass. It is objected that excursionists traveling by ordinary trains would overload them, and there would be difficulty in keeping time; but if it were known that the period over which this system of traveling by ordinary trains was an extended one there would be no necessity for overcrowding the trains, but even in that case the resources of the railway company would be found amply sufficient to overcome the objection of overloading which unfortunately is too seldom experienced on our railway system.

With regard to the present state of the law as affecting compensation for accidents, we are glad to see that the two judges, Baron Martin and Baron Bramwell, in their evidence before the committee, admit the necessity for some change in the present unsatisfactory state of legislation on the subject. It is a remarkable circumstance that these two learned judges are at issue upon the very important question of the terms of the contract upon which a railway company may carry passengers. It has been for some time argued that a railway company might make some extra charge beyond the fare in the way of insurance. Baron Bramwell said that a company, while it could not refuse to carry passengers, might say: "If we carry you at the ordinary fares we will not be liable for any accident." Baron Martin, on the other hand, considered that a railway company could not by any arrangement absolve itself from liability for injury sustained. The view which Baron Bramwell takes of the matter is that the conveyance of a passenger is really a question of contract. "A man taking a railway ticket made a bargain between himself and the company that they would conduct themselves with reasonable care and diligence in the matter, and if he came to harm on the journey, the bargain was broken by the company. The same learned judge gave his opinion in favor of the principle of limiting the liability by way of assurance, and now that this principle has been adopted in the case of workmen's trains, the Legislature cannot refuse to extend it to passengers generally; and it appears to us that the best way of carrying this principle into effect is to permit the companies to extend the system of insurance, which is already in operation by independent associations at many of our railway stations. Mr. Baron Martin took the same view of the insurance system, and thought that the companies should not be held liable for damages beyond the amount so insured; but speaking from experience, he thought—and the opinion will be shared by a large number of persons interested in railways—that juries would in the majority of cases give the full amount for which the passenger was insured. They would look at the arrangement as being of the nature of a contract, and regarding railway companies only as wealthy corporations which exist for the benefit of the public, would without compunction give the plaintiffs the full measure of the damages which they seek. Both of the learned judges were of opinion—and on this point we think they spoke without having fully considered the matter—that excessive damages were not given, and a very useful hint was given by one of the judges as to the wisdom of trying cases of this kind by special juries, who gave their verdicts according to the value they attached to their own lives and limbs, and which in many cases might exceed the sum at which an ordinary jury would assess their damages.

We are glad to find that the system which we have upon several occasions recommended, of having compensation cases tried in courts devoted to such claims, and before assessors appointed by the Board of Trade, meets with the approval of both of the learned judges, and the suggestions that there should be a medical man attached to such court, perfectly independent both of the railway companies and of the passengers, and who should give his opinion as to the condition of the passengers and the effect of the injury, is also an exceedingly valuable one, and, if adopted, would prevent the scandalous scenes which are too often presented in the trials of cases of this kind from the conflict of evidence of professional men retained on either side.

The evidence of Sir E. Watkin, as bearing on the frauds to which railway companies were subjected, cannot fail to have weight with all who take a dispassionate view of the question. Sir Edward pointed out that the proportion of cases suspected to be fictitious was as much as 20 per cent. of the damages, of which 12½ went to the lawyer and 7½ to the medical man. Another serious cause of complaint is that the companies are liable to have actions brought against them so long after the occurrence of any accident that it was impossible to make due inquiries into the merits of the cases. Some limits might fairly be imposed in regard to the time in which actions for compensation should be brought. On the whole, railway shareholders have reason to be satisfied with the evidence given before the committee, and with the prospect which exists of an amendment of the present state of the law regarding compensation for railway accidents.—*London Railway News.*

Street-Car Improvement.

Crowded, dirty, and close, these are the adjectives that properly apply to the cars in common use on the street lines of New York and neighboring cities. The crowding is an evil so long borne by a patient and suffering public that it may be considered established by the common law; the dirt has held its own so firmly against journalistic attacks on foul seat-cushions and fouler straw upon the floors that it may be acknowledged unimpugnable; the closeness is more or less unavoidable in winter, when warmth is more sought than fresh air; but in summer it is alike inexcusable and unendurable. Herein lies the only point in which city railway companies have even in a single instance shown the weakness of caring either for the comfort of their patrons or the weight of public approval. The Brooklyn lines have been for some few years past provided with a few open cars for summer use, and so great is the esteem in which they are held that passengers often willingly wait two or three trips of the other cars in order to avail themselves of the open conveyance.

Such cars and no others should be used on city railroads during the sweltering weather that more or less obtains in our latitude from the first of June to the last of September: but it would manifestly be asking too much of corporations created to make dividends to require them to have two full complements of rolling stock, each lying idle one-half the year. Cannot, therefore, some ingenious friend of the people devise a convertible car which, by the removal of ends and sides, and possibly some manipulation of seats, may be transformed to an open summer conveyance, and yet be capable, in its normal condition, of serving every purpose for which the present rectangular boxes on wheels are available? Whoever will do this will deserve better the thanks of the public, and have a better chance to make money from his improvements, than the proprietors of nine-tenths of the noisily heralded plans for ameliorating the troubles and inconveniences of city transit.—*American Artisan.*

—A telegram from Cedar Rapids, Iowa, dated yesterday (July 21) says that the Burlington & Minnesota Railroad Company commenced work on their bridge across the Cedar river, south of Cedar Rapids the day before. Track laying has been suspended on that division for a few days, but it is expected that iron will arrive during next week sufficient to complete the road from Laporte to Waterloo. The track will reach Waterloo by the middle of August.

Railroads as Common Carriers of Live Stock.

The Supreme Court of Michigan, at its recent term, decided a case affecting the question of the liability of railway companies as common carriers in the transportation of live stock. The plaintiffs in the original action were shippers of cattle; they sued the Michigan Southern & Northern Indiana Railroad Company in an action of assumpsit, alleging a contract whereby the company undertook to transport, take care of, and safely deliver certain cattle and hogs, and that the company had herein failed, delay having taken place, some of the animals dying in consequence, and others being injured in condition and value.

The plaintiffs did not undertake to prove an express contract, but relied upon general facts, circumstances and usage, to show that the company was liable, by implied contract, as common carriers; in other words, that the company was liable for all injury and loss not occasioned by the act of God or of the public enemy. The Supreme Court of Michigan, after elaborate argument and thorough examination, held that the railway company was not responsible, as common carriers, for the transportation of live animals.

The unanimous opinion of the court was delivered by Judge Christiancy. It is quite elaborate, the conclusion being based upon a train of argumentation going into both the history and philosophy of the law of common carriers. The court assents to the proposition that the railroad company is liable, as a common carrier, to transport all such property tendered them, as was usually transported by railroads at the time of its charter. The transportation of cattle and live stock, however, the court observes, by common carriers by land, was unknown to the common law when the duties and responsibilities of common carriers were fixed. Live animals have peculiar wants of their own, and their carriage requires peculiar skill and care. Indeed, Judge Christiancy goes so far as to say that, but for its necessity, the transportation of cattle by rail would be gross cruelty, and indictable as such. The risk, he says, may be greatly lessened by care and vigilance, by feeding and watering at proper intervals, by getting up those that are down and otherwise. But this imposes a degree of care and labor so different from what is required for other property, that it is concluded this kind does not fall within the reasons upon which the common law liabilities of common carriers were fixed. There being nothing in the charter of the company, or the statutes of the State, making railways liable as common carriers, for such property, the company is released.

The court reviews a number of cases, English and American, and concludes from these also, that in the absence of statute, contract, or clearly proved usage, a railway company is not a common carrier for this species of property. The facts that were introduced—and the granting of passes to owners or shippers of stock, that they might take care of it themselves, was a strong point in the case against common carrier liability—were adduced to show that, by custom, the company was, for such property, a common carrier; but the court held that they did not show such liability And thus the shippers were beaten at every point, and the railway gained a clear case. Such is the law of Michigan on this question, as interpreted in its highest court of justice.—*Chicago Evening Post.*

—A telegram from Washington dated the 21st, says that the question as to which railroad shall have the right of way through the Indian Territory has been finally decided by the Attorney General. The contest was chiefly between the Joy Missouri River & Fort Scott road and the Parsons road, through the Neosho Valley. The decision was in favor of the latter line. Some time since Secretary Cox decided, after hearing full arguments on both sides, that under the treaty but a single trunk line could be built through the Indian country. This decision is affirmed and the above road designated. Parsons at once telegraphed to put a large force of graders at work.

—A telegram from Philadelphia dated the 21st inst. says: "An election was held yesterday by the stockholders of the Philadelphia & Erie Railroad to approve of the new lease of the road by the Pennsylvania Central Railroad Company. Prior to the election a protest was presented on behalf of the Cleveland, Painesville & Ashtabula Railroad, against allowing the Pennsylvania Central to vote on nearly 40,000 shares owned by that company, on the ground that the new lease is in favor of that company, and that company should not be permitted by its own vote to discharge themselves from the obligations of a former lease; 61,168 votes were cast in favor, and 27,126 against.

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OFFICE OF THE GILMAN, CLINTON & SPRINGFIELD RAILROAD COMPANY, Springfield, July 1, 1870.

Sealed proposals will be received at this office until 12 oclock m. of Monday, July 25th, for the delivery of cross-ties at Gilman, Clinton, Farmers' City, Mt. Pulaski or Springfield.

Proposals will also be considered for ties to be delivered on the line of the Illinois Central, or Toledo, Peoria & Warsaw railroads.

Ties must be sound timber, and not less than eight feet long, six inches thick, with eight inches face.

Parties desiring to furnish ties will please state in their proposals the number they desire to furnish, and time and place of Delivery. Also, the kind of timber, and whether hewed or sawed.

No proposal will be considered for the delivery of ties later than the 1st of December. The price of each kind of timber should be distinctly stated.

S. H. MELVIN, President.

WM. U. THWING,

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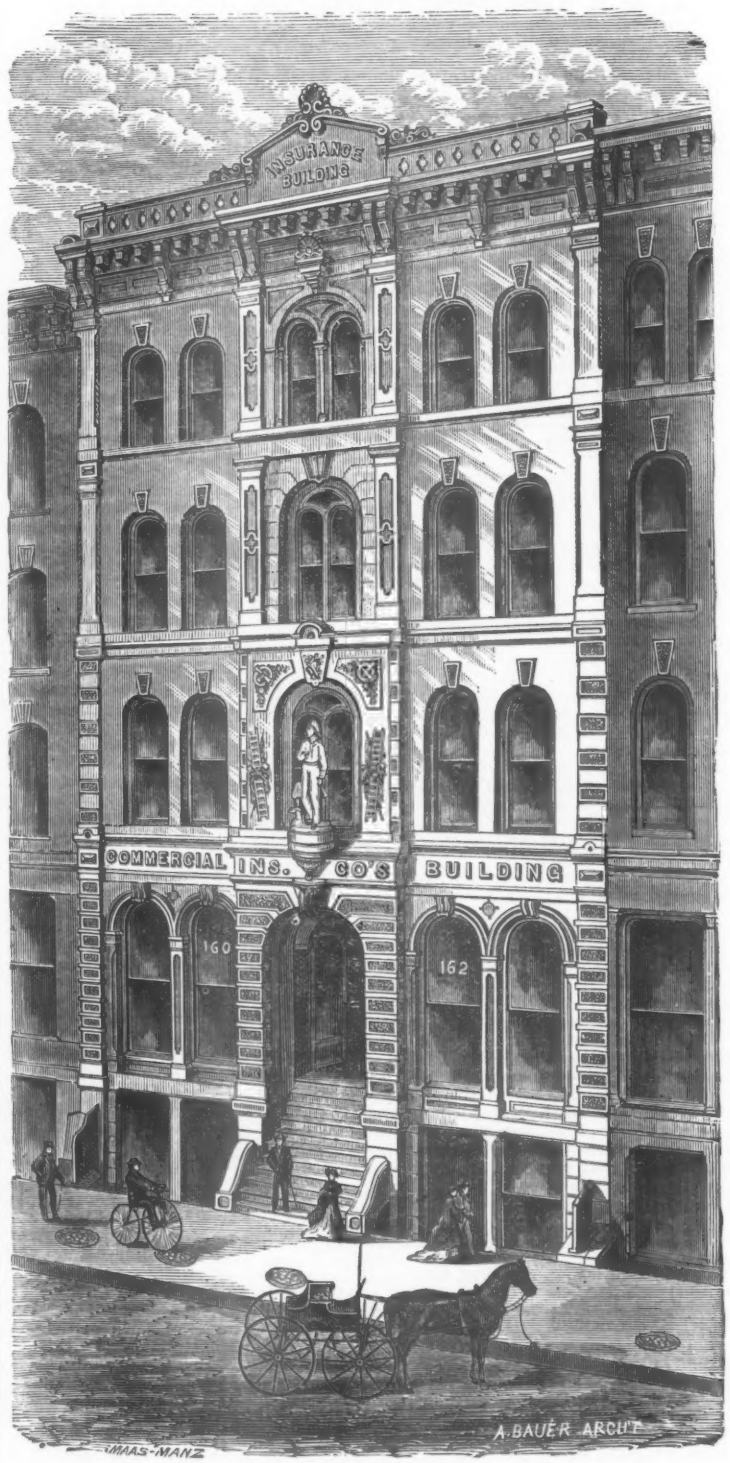

Organized May 1st, 1865.

Assets, May 1, 1870,	$403,282.91
Unincumbered Real Estate,	170,549.88
Receipts since Organization,	583,964.31
Losses Paid,	219,041.52

DIRECTORS.

J. F. ARMOUR,	*JOHN E. CHAPMAN,*	*JOHN C. DORE,*
WM. V. KAY,	*E. F. LAWRENCE,*	*L. B. SIDWAY,*
T. H. SEYMOUR,	*H. SPRUANCE,*	*H. SPRAGUE.*

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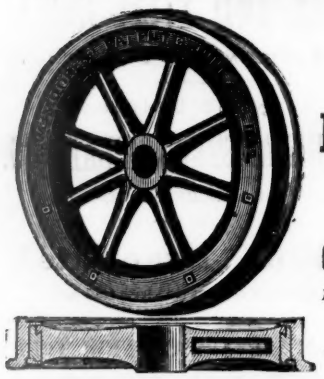

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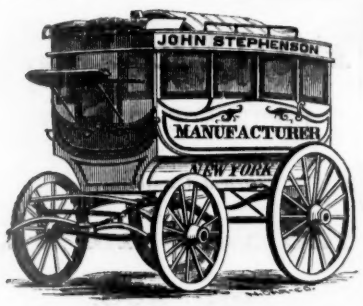

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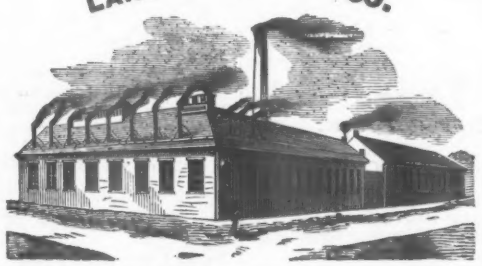

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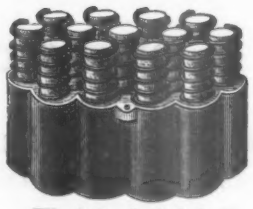

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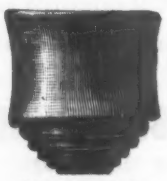

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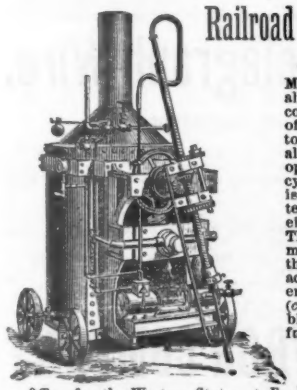

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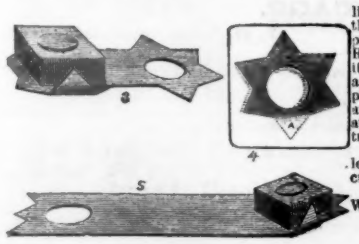

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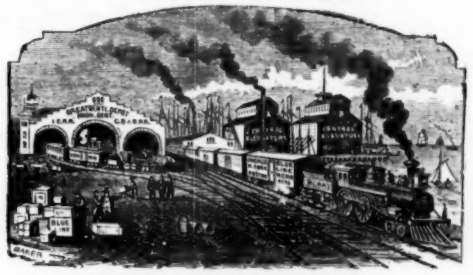
1870.  1870.

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CHAS. J. PUSEY, **P. O. Address—Box 5222.** EDW'D H. PARDEE.

Pusey & Pardee,

74 BROADWAY, NEW YORK.

American and English Rails,

LOCOMOTIVES AND CARS FISH-PLATES, SPIKES, &c.

—SOLE AGENTS FOR—

Atkins Brothers' Pottsville Rolling Mills, and G. Buchanan & Co., of London.

☞ Special attention given to filling orders for small T and **STREET RAILS,** of every weight and pattern.

OLD RAILS BOUGHT OR RE-ROLLED, AS DESIRED.

J. E. FRENCH. W. S. DODGE. D. W. CROSS.

Winslow Car Roofing Company.

PATENT IRON CAR ROOFS.

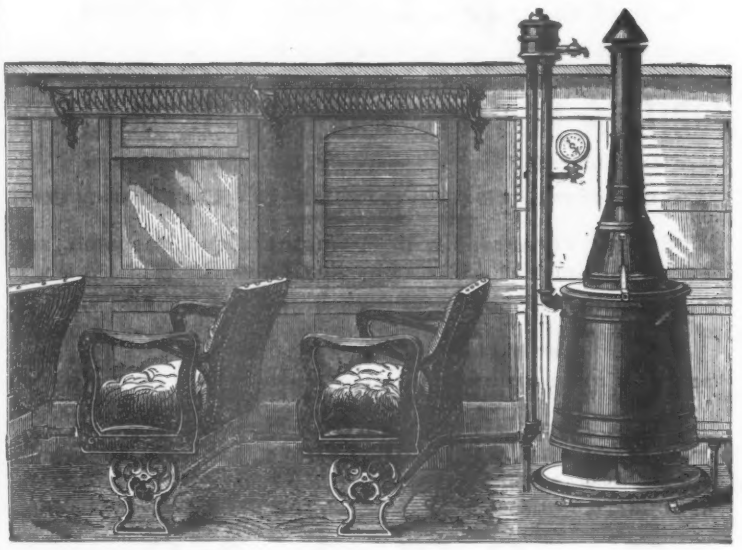
Established, 1859.

No. 211 Superior St. CLEVELAND, O.

Over 20,000 Cars covered with this Roof! We claim that these Roofs will keep Cars dry, and will last as long as the Cars they cover without any extra expense after once put on.

☞ SEND FOR CIRCULARS.

WARMING AND VENTILATING Railroad Cars BY HOT WATER.



BAKER'S PATENT CAR WARMER.—One way of Applying it.

A very simple, safe and efficient plan for

Warming Railway Carriages!

— BY —

HOT WATER PIPES,

WHICH RADIATES THE HEAT DIRECTLY AT THE FEET OF EACH PASSENGER WITHOUT THE NECESSITY OF GOING TO THE STOVE TO GET WARMED!!

☞ All the finest Drawing-Room and Sleeping Cars in the United States have it, or are adopting it. Full descriptive pamphlets furnished on application.

Baker, Smith & Co.,

Cor. Greene and Houston Sts., N. Y., and 127 Dearborn St., Chicago.

MOWRY

Car & Wheel Works,

MANUFACTURERS OF

Railroad Cars, Wheels and Axles, Chilled Tires,

AND ALL DESCRIPTIONS OF

Engine, Car, and Bridge Castings, of any Pattern

Wheels of all sizes constantly on Hand.

A. L. MOWRY, President, NEW YORK CITY. N. G. GREEN, Treas. and Supt., CINCINNATI, OHIO

OFFICES: No. 80 Broadway, New York; No. 69 West 3d Street, Cincinnati, Ohio.
WORKS: Cor. Lewis and East Front Streets, Cincinnati, Ohio.

American Compound Telegraph Wire.

More than 3000 Miles now in Operation,

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES, connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance. OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO.
234 West 29th Street, New York.

BLISS, TILLOTSON & CO., Western Agents,
247 South Water Street, Chicago.

MANSFIELD ELASTIC FROG COMPANY

OF CHICAGO.

AMOS T. HALL, President. | J. H. DOW, Superintendent.

Are now prepared to receive and promptly execute orders for RAILROAD FROGS and CROSSINGS warranted to prove satisfactory to purchasers

For DURABILITY, SAFETY and ELASTICITY—being a combination of Steel, Boiler Plate and Wood—they are UNEQUALED, as Certificates of Prominent Railroad Officials will testify.

The SAVING TO ROLLING STOCK AND MOTIVE POWER is at least equal to double the cost of the FROG. Orders should be addressed to

CRERAR, ADAMS & CO., Gen'l Agents,

No. 18 Wells Street, CHICAGO.

CHICAGO & NORTHWESTERN R. W.

Comprising the PRINCIPAL RAILROADS from CHICAGO Directly NORTH NORTH-WEST and WEST.

ALL RAIL TO THE PACIFIC OCEAN!

Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

8:15 A. M. Cedar Rapids Pass | **9:15 P. M. Night Mail.**
10:30 A. M. Pacific Express. | **9:15 P. M. Rock Island Pass.**
10:30 A. M. Rock Island Exp. | **4:00 P. M. Dixon Passenger.**

For Sterling, Rock Island, Fulton, Clinton, Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico, Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA,.....	23	$20.00	To SACRAMENTO,.	4½	$118.00
" DENVER,.....	52	70.75	" SAN FRANCISCO,	5	118.00

TRAINS ARRIVE:—Night Mail, **7.00** a. m.; Dixon Passenger, **11.10** a. m.; Pacific Express, **3:50** p. m.; Rock Island Express, **3:50** p. m.; Cedar Rapids Passenger, **6:50** p. m.

FREEPORT LINE.

9.00 A. M. & 9.45 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.
4.00 P. M., Rockford Accommodation.
5.30 P. M., Geneva and Elgin Accommodation
6.10 P. M., Lombard Accommodation.
5:50 P. M., Junction Passenger.

TRAINS ARRIVE:—Freeport Passenger, **2:30** a. m., **3:00** p. m.; Rockford Accommodation, **11:10** a. m.; Geneva and Elgin Accommodation, **8:45** a. m.; Junction Passenger, **8:10** a. m.; Lombard Accommodation, **6:50** a. m.

WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. **DAY EXPRESS,** for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.
3.00 P. M., Janesville Accommodation.
5.00 P. M. **NIGHT EXPRESS,** for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.
5.30 P. M., Woodstock Accommodation.
6:20 P. M., Barrington Passenger.

TRAINS ARRIVE:—5:30 a. m., **7:45** a. m., **10:10** a. m., **1:00** p. m. and **7:15** p. m.

MILWAUKEE DIVISION.

MILWAUKEE MAIL,		**8:00 A. M.**
EXPRESS, (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee,....	**10:00 A. M.**	**5:00 P. M.**
EVANSTON PASSENGER,		**11:40 A. M.**
HIGHLAND PARK PASSENGER,		**1:30 P. M.**
MILWAUKEE ACCOMMODATION, with Sleeping Car attached.		**11:00 P. M.**
EVANSTON ACCOMMODATION, (Daily,) from Wisconsin Div. Depot.		**1:30 P. M.**
KENOSHA ACCOMMODATION, (Sundays excepted) from Wells St. Depot....		**4:15 P. M.**
AFTERNOON PASSENGER, from Milwaukee Div. Depot.		**5:00 P. M.**
WAUKEGAN ACCOMMODATION, (except Sundays) from Wells St. Depot....		**5:25 P. M.**
WAUKEGAN PASSENGER, (Sundays excepted) from Wells St. Depot.		**6:15 P. M.**

TRAINS ARRIVE:—Night Accommodation, with Sleeping Car, **5:00** a. m.; Day Express, **4:30** p. m. Milwaukee Mail, **10:15** a. m.; Afternoon Passenger, **8:00** p. m.; Waukegan Accommodation, **8:25** a. m.; Kenosha Accommodation, **9:10** a.m.; Evanston Accommodations, **1.50** and **4.00** p. m.; Waukegan Passenger, **7:55** a. m.; Highland Park Passenger, **4.00** p. m.

PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

THROUGH TICKETS Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

H. P. STANWOOD, Gen. Ticket Agt. **GEO. L. DUNLAP,** Gen'l Supt.

Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

THE DIRECT ROUTE!

CHICAGO, RACINE & MILWAUKEE,

— TO —

Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,

OMAHA, SAN FRANCISCO

AND ALL PRINCIPAL POINTS IN

Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

FRED. WILD, Gen. Ticket Agent. **D. A. OLIN,** Gen. Superintendent.

CRERAR, ADAMS & CO.,

MANUFACTURERS AND DEALERS IN

Railroad Supplies!

—AND—

CONTRACTORS' MATERIAL.

11 and 13 Wells Street,

CHICAGO, ILL.

Manufacturers of IMPROVED HEAD-LIGHTS for Locomotives, Hand and Signal Lanterns, Car and Station Lamps, Brass Dome Casings, Dome Mouldings, Cylinder Heads, and Car Trimmings, of Every Description.

Pan-Handle

— AND —

Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Saturday, JULY 10th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

8:10 A. M. DAY EXPRESS.

[SUNDAYS EXCEPTED.] Via Richmond. Arriving at

COLUMBUS ...	2:35 A. M.	HARRISBURG..	10:35 P. M.	NEW YORK....	6:40 A. M.	WASHINGTON..	5:50 A. M.
PITTSBURGH..	12:00 M.	PHILADELPHIA	3:10 A. M.	BALTIMORE....	2:30 A. M.	BOSTON.....	5:05 P. M.

7:40 P. M. NIGHT EXPRESS.

[SATURDAYS EXCEPTED.] Arriving at:

COLUMBUS..	11:15 A. M.	HARRISBURG..	5:10 A. M.	NEW YORK...	12:10 P. M.	WASHINGTON.	1:10 P. M.
PITTSBURGH..	7:05 P. M.	PHILADELPHIA	9.35 A. M.	BALTIMORE...	9:00 A. M.	BOSTON.....	11:50 P. M.

Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

CINCINNATI & LOUISVILLE AIR LINE SOUTH.

42 Miles the Shortest Route to Cincinnati,
18 Miles the Shortest Route to Indianapolis and Louisville.

—FROM ONE TO—

2 Hours the Quickest Route to Cincinnati!

THE SHORTEST AND BEST ROUTE TO

Columbus, Chillicothe, Hamilton, Wheeling, Parkersburg, Evansville, Dayton, Zanesville, Marietta, Lexington, Terre Haute, Nashville,

ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.

— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —

New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,

AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:

THROUGH WITHOUT CHANGE OF CARS!

8:10 A. M. (Sundays excepted) Arriving at		7:40 P. M. (Saturdays excepted.) Arriving at	
LOGANSPORT	1:15 P. M.	LOGANSPORT	1:30 A. M.
KOKOMO	2:33 P. M.	KOKOMO	2:45 A. M.
CINCINNATI	9:30 P. M.	CINCINNATI	10:30 A. M.
INDIANAPOLIS	5:00 P. M.	INDIANAPOLIS	5:40 A. M.
LOUISVILLE	11:30 P. M.	LOUISVILLE	3:50 P. M.

Lansing Accommodation: Leaves 5:10 P. M. Arrives 8:55 A. M.
Dolton Accommodation: Leaves 10:10 A. M. Arrives 3:25 P. M.

PULLMAN'S PALACE SLEEPING CARS!

Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets via **COLUMBUS** for the East, and via **"The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

WM. L. O'BRIEN, Gen. Pass. and Ticket Agent, Columbus. **I. S. HODSDON,** Northwestern Pass. Agt., Chicago.

D. W. CALDWELL Gen. Supt. Columbus.

KANSAS PACIFIC RAILWAY.

Great Smoky Hill Route!

— TO —

COLORADO, NEW MEXICO, ARIZONA, UTAH,

Montana, Nevada, California and Northern States of Old Mexico.

COMPLETED THROUGH KANSAS, TO

Carson, Colorado, 487 Miles West of Kansas City and Leavenworth.

Close Connections are made with Express Trains of the HANNIBAL & ST. JOSEPH and NORTH MISSOURI RAILROADS, at KANSAS CITY, and with MISSOURI PACIFIC RAILROAD at STATE LINE.

DAILY EXPRESS TRAINS are run between

KANSAS CITY, LEAVENWORTH, LAWRENCE,

Topeka, Wamego, Manhattan, Junction City, Salina, Brookville,

HARKER, HAYS and CARSON.

Pullman's Sleeping Cars Attached to Night Express Trains!

Passenger Time from Kansas City to Denver, Less than 50 Hours.

Hughes & Co.'s Four-Horse Concord Coaches leave Carson daily for Denver, Central City, Georgetown, &c.

Southern Overland Passenger Express and Mail Coaches leave Carson daily for Fort Lyon, Pueblo, Trinidad, Fort Union, Las Vegas, Santa Fe, &c.

Ask for Through Tickets via Kansas Pacific Railway, "Smoky Hill Route." Freight and Passage Rates as Low and Time as Quick as by any other Route.

R. B. GEMMELL, Gen. Ticket Agent **A. ANDERSON, Gen. Supt.**

THE FAVORITE THROUGH PASSENGER ROUTE!

Chicago, Burlington & Quincy

RAILROAD, AND CONNECTIONS.

3 THROUGH EXPRESS TRAINS DAILY.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA, - -	23	$20.00	To DENVER, - -	2¼	$70.75
" ST. JOSEPH, -	21	19.50	" SACRAMENTO,	4½	118.00
" KANSAS CITY, -	22	20.00	" SAN FRANCISCO,	5	118.00

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

BURLINGTON, KEOKUK, COUNCIL BLUFFS AND OMAHA.

7:40 A. M. **MAIL AND EXPRESS,** (Daily except Sunday,) stopping at all stations between Chicago and Burlington; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c., &c.

10:45 A. M. **PACIFIC EXPRESS,** (Daily except Sunday,) stopping only at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Rock Island Crossing, Buda, Kewanee, Galva, Galesburg, and Monmouth, between Chicago and Burlington. **PULLMAN PALACE DRAWING ROOM CAR** attached to this train daily from Chicago

TO COUNCIL BLUFFS AND OMAHA, WITHOUT CHANGE!

11:30 P. M. **NIGHT EXPRESS,** (Daily, except Saturday,) stopping at all principal stations between Chicago and Burlington. ELEGANT DAY COACHES, and a **PULLMAN PALACE SLEEPING CAR** are attached to this train from **Chicago to Burlington, without change!** This is the only Route between

CHICAGO, COUNCIL BLUFFS & OMAHA,

— RUNNING THE CELEBRATED —

Pullman Palace Dining Cars!

The Shortest, Best, Quickest and only Route between

CHICAGO & KEOKUK,

Without Ferrying the Mississippi River!

QUINCY, ST. JOSEPH, LEAVENWORTH AND KANSAS CITY.

10:45 A. M. **PACIFIC EXPRESS,** (Daily, except Sunday,) with PALACE COACH attached, running through from Chicago to KANSAS CITY, **Without Change!**

5:00 P. M. **EVENING EXPRESS,** (Daily, except Sunday,) with **Pullman Palace Drawing Room Sleeping Car** attached, running through from Chicago to QUINCY, WITHOUT CHANGE!

11:30 P. M. **NIGHT EXPRESS** (Daily, except Saturday,) with **Pullman Palace Sleeping Car** attached from Chicago to GALESBURG; PALACE DAY COACHES from Chicago to QUINCY, **Without Change!**

☞ This is the Shortest, Quickest and only Route between ☜

CHICAGO AND KANSAS CITY,

WITHOUT CHANGE OF CARS OR FERRY.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

St. Joseph, Atchison, Weston, Leavenworth,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave { RIVERSIDE & HINSDALE ACCOMMODATION, 7:00 A. M. 1:30 & 6:15 P. M.
MENDOTA PASSENGER ..... 4:15 P. M.
AURORA PASSENGER ..... 5:30 P. M.

Trains Arrive:—Mail and Express, 3:45 p. m.; Atlantic Exp., 4:15 p. m., except Sunday; Night Exp, 9:05 a. m., except Monday; Mendota Passenger, 10:00 a. m.; Aurora Passenger, 8:15 a. m.; Quincy Passenger 7:30 P. M.; Riverside and Hinsdale Accommodation, 6:50 and 9 a. m and 5:30 p. m., except Sunday.

Ask for Tickets via Chicago, Burlington & Quincy Railroad, which can be obtained at all principal offices of connecting roads, and at Company's office in Great Central Depot, Chicago, at as low rates as by any other route.

ROB'T HARRIS, Gen'l Superintendent, CHICAGO.
SAM'L POWELL, Gen'l Ticket Agent, CHICAGO.
E. A. PARKER, Gen. West. Pass. Agt., CHICAGO.

☞ PASSENGERS GOING WEST! ☜

To Missouri, Kansas, Nebraska, Colorado or New Mexico, Should Buy Tickets via the Short Route

HANNIBAL & ST. JOSEPH R. R. LINE,

Three Express Trains from Quincy or Macon to St. Joseph.

—ALSO DIRECT—

To Kansas City

☞ WITHOUT CHANGE OF CARS! ☜

CONNECTIONS ARE CLOSE AND DIRECT FOR

ATCHISON, WESTON & LEAVENWORTH.

CONNECTIONS:

AT KANSAS CITY, with Kansas Pacific Railway, for Lawrence, Ottawa, Topeka, Fort Riley Junction City, Fort Hays, Sheridan, &c.
AT KANSAS CITY, with Kansas City, Fort Scott, and Galveston Railroad, for Fort Scott, Fort Gibson, Galveston, &c.
AT ST. JOSEPH, with St. Joseph & Council Bluffs Railroad, ALL RAIL from St. Joseph to

Nebraska City, Council Bluffs & Omaha.

AT OMAHA, with Nebraska Union Pacific Railroad, for Fort Kearney, Julesburg, Cheyenne, Laramie, Benton, &c.
AT COUNCIL BLUFFS, for Sioux City, all Rail.

☞ By this Line, passengers have choice of Overland Routes, either via Smoky Hill or Platte Route To Denver, Central City, Salt Lake, Sacramento, California and all points in the Mining Regions.

Daily Overland Coaches via Smoky Hill Route leave Sheridan, end of U. P. R. R., for Santa Fe and New Mexico.

Through Tickets for Sale at all Ticket Offices.

P. B. GROAT, Gen. Ticket Agent. **GEO. H. NETTLETON, Gen. Supt.**
HENRY STARRING, Gen. Agent, Chicago.

Old, Reliable, Air-Line Route!

CHICAGO, ALTON & ST. LOUIS R. R.

SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO

Bloomington, Springfield, Jacksonville, Alton,

— AND —

ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS, WITH MORNING AND EVENING TRAINS

—FOR—

ATCHISON, LEAVENWORTH, KANSAS CITY,

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

EXPRESS MAIL, [Except Sundays]	8:10 A. M.
LIGHTNING EXPRESS, [Except Saturdays and Sundays]	9:50 P. M.
NIGHT EXPRESS, [Except Saturdays]	6:00 P. M.
JOLIET ACCOMMODATION, [Except Sundays]	4:40 P. M.
JACKSONVILLE EXPRESS, [Daily]	6:00 P. M.

Trains arrive at Chicago at 8.00 P. M., 8.30 A. M. and 6:00 A. M. Joliet Accom., 9.40 A. M.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

Through Tickets can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

A. NEWMAN, Gen. Pass. Agent. **J. C. McMULLIN, Gen. Supt.**

North Missouri R. R.

PASSENGERS FOR

KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

— IS —

11 MILES SHORTER than any other Route!

BETWEEN

St. Louis and Kansas City.

15 Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

49 MILES SHORTER TO ST. JOSEPH!

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ Three Through Express Trains Daily! ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ **FOR TICKETS,** apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

C. N. PRATT, Gen. Eastern Agt., 111 Dearborn-st. CHICAGO.
S. H. KNIGHT, Gen. Superintendent, ST. LOUIS.

JAS. CHARLTON, Gen. Pass. and Ticket Agt., St. Louis.

Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

ALL POINTS WEST!

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

PALACE SLEEPING CARS on all NIGHT TRAINS.

Baggage Checked Through Free!

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

W. B. HALE, Gen. Pass. and Ticket Agt.
THOS. McKISSOCK, General Superintendent.

THREE HOURS IN ADVANCE OF ALL OTHER ROUTES!

Sixty-One Miles the Shortest Line! Only 27 Hours!

— FROM —

CHICAGO TO NEW YORK.

Pittsburgh, Ft. Wayne & Chicago and Pennsylvania Central

IS THE ONLY ROUTE RUNNING ITS ENTIRE TRAIN THROUGH TO PHILADELPHIA AND NEW YORK, AND THE ONLY ROUTE RUNNING

THREE DAILY LINES OF PULLMAN'S DAY AND SLEEPING PALACES,

— FROM CHICAGO TO —

PITTSBURGH, HARRISBURG, PHILADELPHIA & NEW YORK,

☞ WITHOUT CHANGE! ☜

WITH BUT ONE CHANGE TO

BALTIMORE, PROVIDENCE, NEW HAVEN,

HARTFORD, SPRINGFIELD, WORCESTER AND BOSTON!

And the Most Direct Route to Washington City.

☞ Trains Leave WEST SIDE UNION DEPOT, corner West Madison and Canal Streets, as follows:

LEAVE:	Mail	Fast Express.	Pacific Exp.	Night Exp.	VALPARAISO ACC'N. (Leaves CHICAGO daily, except Sunday, at 4.15 P. M.)
CHICAGO	5.50 A. M.	11.00 A. M.	5.15 P. M.	9.00 P. M.	
PLYMOUTH	9.50 "	1.50 P. M.	s. 9.10 "	2.13 A. M.	
FORT WAYNE	12.40 P. M.	3.30 "	11.30 "	B. 5.30 "	
LIMA	3.15 "	.... "	1.25 A. M.	8.10 "	
FOREST	4.37 "	.... "	2.48 "	9.40 "	
CRESTLINE	6.00 A. M.	s. 6.55 "	4.30 "	D. 12.05 P. M.	
MANSFIELD	6.42 "	7.16 "	5.00 "	12.34 "	
ORRVILLE	9.05 "	8.42 "	6.45 "	2.27 "	
ALLIANCE	10.45 "	9.55 "	B. 8.40 "	3.55 "	
ROCHESTER	D. 2.05 P. M.	12.17 A. M.	10.52 "	6.02 "	
PITTSBURGH	3.15 "	12.50 "	12.45 P. M.	s. 7.50 "	5.30 A. M.
BLAIRSVILLE BRANCH	6.05 "	.... "	2.49 "	9.54 "	7.23 "
JOHNSTOWN	6.56 "	.... "	3.37 "	10.42 "	8.08 "
CRESSON	7.58 "	.... "	4.38 "	11.43 "	9.04 "
ALTOONA	s. 9.05 "	B. 4.40 "	s. 5.45 "	12.35 A. M.	B. 10.05 "
HUNTINGDON	10.21 "	.... "	7.04 "	1.45 "	11.14 "
LEWISTOWN	11.44 "	.... "	8.28 "	2.59 "	12.25 P. M.
HARRISBURG	2.10 A. M.	8.23 "	10.45 "	5.20 "	D. 2.50 "
LANCASTER	3.40 "	.... P. M.	12.15 A. M.	7.00 "	4.10 "
DOWNINGTON	5.00 "	.... "	1.40 "	B. 8.16 "	5.35 "
ARRIVE:					South'n Exp.
PHILADELPHIA	6.30 "	12.20 "	3.10 "	9.40 "	7.00 "
NEW YORK, VIA PHILADELPHIA	10.41 "	3.00 "	6.43 "	1.00 P. M.	10.36 "
NEW YORK, VIA ALLENTOWN	.....	3.50 "	.....	12.05 P. M.	.....
BALTIMORE	.....	12.10 "	4.20 "	9.00 A. M.	7.00 "
WASHINGTON	.....	3.40 "	5.50 "	1.00 P. M.	10.00 "
BOSTON	9.00 P. M.	5.50 A. M.	5.05 P. M.	11.50 "	.....

THE FAST EXPRESS Leaves Chicago daily, except Sunday; the entire Train,—Baggage, Day and Pullman's Palace Cars—RUNNING THROUGH from Chicago to New York, via Mantua Junction; leaves Pittsburgh daily, except Monday. This train **reaches NEW YORK in time to make close connection for BOSTON!** No other Route through New York makes it! Arrives in BALTIMORE **Five Hours,** and WASHINGTON **Four Hours in Advance of Rival Routes!**

THE PACIFIC EXPRESS Leaves Chicago and Pittsburgh daily, for Philadelphia and New York, with PULLMAN PALACE CARS from Chicago; leaves Harrisburg for Baltimore daily, except Sunday; has SLEEPING CARS from Chicago to Pittsburgh, and from Altoona to Philadelphia. This train arrives in BALTIMORE **Nine Hours,** and WASHINGTON **Seven Hours, in Advance of all other Lines!**

THE NIGHT EXPRESS Leaves Chicago daily, except Saturday and Sunday; leaves Pittsburgh daily, except Sunday; leaves Harrisburg for Baltimore daily; has PULLMAN'S PALACE CARS from Chicago to Philadelphia and New York; has SLEEPING CARS from Chicago to Crestline, and from Pittsburgh to New York, Philadelphia and Baltimore. This train reaches BALTIMORE **Three Hours in Advance of competing Routes!**

THE MAIL Leaves Chicago daily, except Sunday, stopping at all Stations, and reaching Crestline the same evening [where passengers can transfer to Day Express]; leaves Crestline [Express,] the next morning, and leaves Pittsburgh daily, except Sunday. SLEEPING CARS from Pittsburgh to Philadelphia.

THE SOUTHERN EXPRESS Leaves PITTSBURGH daily, except Monday, with SILVER PALACE CARS to Philadelphia and New York; leaves Harrisburg for Baltimore daily, except Sunday.

BOSTON AND NEW ENGLAND PASSENGERS will find this Route especially Desirable, as it Gives them an opportunity of Seeing the FINEST VIEWS AMONG THE ALLEGHANY MOUNTAINS,

Besides Visiting PITTSBURGH, PHILADELPHIA and NEW YORK, without extra cost!

All New England Passengers holding Through Tickets, will be Transferred, with their Baggage, to Rail and Boat Connections in NEW YORK, WITHOUT CHARGE.

Close Connections Made at Lima for all Points on the Dayton & Mich. and Cin., Hamilton & Dayton R'ys,

And at CRESTLINE, for CLEVELAND, ERIE, DUNKIRK, BUFFALO, NIAGARA FALLS, and all Points reached via Lake Shore R.R.

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F. R. MYERS, Gen. Pass. and Ticket Agt, P. & F. W. R'y, Chicago. W. C. CLELAND, Gen. Western Pass. Agt, P. Ft. W. & C. R'y, Chicago.

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Broad Gauge! Double Track!

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4 EXPRESS TRAINS DAILY!

From Cleveland, Dunkirk and Buffalo, 625 Miles, to New York, WITHOUT CHANGE of Coaches!

☞ The Trains of this Railway are run in DIRECT CONNECTION WITH ALL WESTERN AND SOUTHERN LINES, for

Elmira, Williamsport, Oswego, Great Bend, Scranton, Newburgh,

NEW YORK, ALBANY, BOSTON, PROVIDENCE

AND PRINCIPAL NEW ENGLAND CITIES.

New and Improved DRAWING ROOM COACHES are attached to the DAY EXPRESS Running THROUGH TO NEW YORK.

☞ **SLEEPING COACHES,** Combining all Modern Improvements, with perfect Ventilation and the peculiar arrangements for the comfort of Passengers incident to the **BROAD GAUGE,** accompany all night trains to New York.

CONNECTIONS CERTAIN! as Trains on this Railway will, when necessary, **wait from one to two hours for Western trains.**

All Trains of Saturday run directly Through to New York.

☞ **Ask for Tickets via Erie Railway,** which can be procured at **66 Clark Street,** Chicago, and at all Principal Ticket offices in the West and Southwest.

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—AND—
MICHIGAN SOUTHERN R.W.

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CHICAGO, BUFFALO & NEW YORK,

WITHOUT CHANGE!

AND THE ONLY RAILWAY

RUNNING PALACE COACHES THROUGH!

—BETWEEN—

CHICAGO & NEW YORK, via BUFFALO

☞ WITHOUT TRANSFER OF PASSENGERS! ☜

All Trains Stop at Twenty-Second Street to Take and Leave Passengers. Baggage Checked at that Station for all Points East.

4 EXPRESS TRAINS DAILY, [Sundays Excepted,] Leave CHICAGO from the New Depot, on Van Buren St., at the head of La Salle Street, as follows

7:30 A. M. MAIL TRAIN. VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 23d Street 7:45 A. M. Stops at all Stations. **Arrives**—Toledo, 6:20 P. M.

11:30 A. M. SPECIAL NEW YORK EXPRESS, -A AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, **11:45 A. M. Arrives**—Elkhart, 2:55 P. M.; Cleveland 10:40 P. M.; Buffalo, 4:10 A. M.; New York, 5:30 P. M.; (Chicago Time) Boston, 11:45 P. M.

This Train has PALACE SLEEPING COACH Attached, Running

THROUGH TO ROCHESTER, WITHOUT CHANGE!

IN DIRECT CONNECTION WITH

Wagner's Celebrated Drawing-Room Coaches on N. Y. Central R. R.

Only Thirty Hours, Chicago to New York!

5:15 P. M. ATLANTIC EXPRESS (Daily), VIA OLD ROAD.

Leave—Twenty-Second Street **5:30 P. M. Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper); arrives at Toledo, 2:50 A. M.; Cleveland, 7:25 A. M. (30 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (30 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 6:40 A. M.

9:00 P. M. NIGHT EXPRESS VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, **9:15 P. M. Arrives**—Toledo, 6:00 A. M. (20 minutes for Breakfast); arrives at Cleveland, 10:35 A. M.; Buffalo, 5:30 P. M.; New York, 11:00 A. M.; Boston, 3:50 P. M.

KALAMAZOO DIVISION.

Leave Chicago 11:30 A. M. Arrive at Kalamazoo 6:05 P. M.; Grand Rapids, 9:25 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 6:50 A. M.; Grand Rapids, 9:40 A. M.

Elkhart Accommodation leaves Chicago, 3:30 P. M. Arrives at Elkhart, 8:20 P. M.

☞ There being no heavy grades to overcome, or mountains to cross, the road bed and track being the smoothest and most perfect of any railway in the United States, this Company run their trains at a high rate of speed with perfect safety.

☞ Travelers who wish to SAVE TIME and make SURE CONNECTIONS, purchase Tickets via

LAKE SHORE & MICHIGAN SOUTHERN R'Y.

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General Superintendent, CLEVELAND, OHIO

F. E. MORSE,
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ILLINOIS CENTRAL RAILROAD.

PASSENGER TRAINS LEAVE CHICAGO FROM THE GREAT CENTRAL DEPOT, FOOT OF LAKE ST

ST. LOUIS AND CHICAGO
THROUGH LINE.

9:30 A. M. DAY EXPRESS Sundays Ex, Arriving in ST. LOUIS at 10:15 P. M.

☞ This Train Reaches St. Louis ONE HOUR & FIFTEEN MINUTES in Advance of any other Route! ☜

8:30 P. M. FAST LINE. Saturdays Excepted. Arriving at ST. LOUIS at 8:00 A. M.

AT ST. LOUIS, Direct Connections are Made FOR

Jefferson City, Sedalia, Pleasant Hill, Macon, Kansas City,

LEAVENWORTH, ST. JOSEPH & ATCHISON,

—Connecting at KANSAS CITY for—

LAWRENCE, TOPEKA, JUNCTION CITY, SALINA, SHERIDAN, &c.

CAIRO, MEMPHIS AND NEW ORLEANS LINE.

9:30 A. M. CAIRO MAIL, Sundays Excepted. Arriving at **Cairo** 2:20 A. M., **Memphis** 12:40 P. M., **Mobile** 9:40 A. M. **Vicksburg** 9:30 A. M., **New Orleans** 11:10 A. M.

8:30 P. M. CAIRO EXPRESS, Except Saturdays. Arriving at **Cairo** 3:15 P. M., **Memphis** 2:30 A. M., **Vicksburg** 5:00 P. M., **New Orleans** 1:30 A. M.

4:45 P. M. CHAMPAIGN PASSENGER, Arriving at **Champaign** at 11:15 P. M.

☞ THIS IS THE ONLY DIRECT ROUTE TO

Humboldt, Corinth, Grand Junction, Little Rock, Selma, Canton, Grenada, Columbus, Meridian, Enterprise,

MEMPHIS, VICKSBURG, NEW ORLEANS & MOBILE.

At NEW ORLEANS, connections are made for

GALVESTON, INDIANOLA,

And all Parts of Texas.

☞ **NOTICE.—This Route is from 100 to 150 MILES SHORTER, and from 12 to 24 HOURS QUICKER than any other.**

THIS IS ALSO THE ONLY DIRECT ROUTE TO

DECATUR, TERRE HAUTE, VINCENNES & EVANSVILLE.

Peoria and Keokuk Line.

9:30 A. M. KEOKUK PASSENGER, Sun. Excepted. Arriving at **Chenoa** 3:15 P. M., **El Paso** 4:05 P. M., **Peoria** 5:40 P. M., **Canton** 7:14 P. M., **Bushnell** 8:59 P. M., **Keokuk** 11:36 P. M., **Warsaw** 12:05 A. M.

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Spacious and Fine Saloon Cars!

WITH ALL MODERN IMPROVEMENTS, RUN UPON ALL TRAINS.

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☞ For Through Tickets, Sleeping Car Berths, Baggage Checks, and information, apply at the office of the Company in the Great Central Depot, foot of Lake St.

Hyde Park and Oakwoods Train.

	LEAVE.	ARRIVE.		LEAVE.	ARRIVE.
HYDE PARK TRAIN,....	*6:20 A. M.	*7.45 A. M.	HYDE PARK TRAIN,....	*3:00 P. M.	*5:15 P. M.
HYDE PARK TRAIN....	*8:00 A. M.	*9.15 A. M.	HYDE PARK TRAIN,....	*6:10 P. M.	*7:35 P. M.
HYDE PARK TRAIN,..	*12:10 P. M.	*1:50 P. M.			

* Sundays Excepted.

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— FROM —

CHICAGO TO NEW YORK CITY, WITHOUT CHANGE.

4 PASSENGER TRAINS LEAVE CHICAGO, DAILY EXCEPT SUNDAY.
(DEPOT, FOOT OF LAKE STREET,) as Follows:

5:00 A. M. (SUNDAYS EXCEPTED.) MAIL TRAIN. Stops at all Stations.
Arrives DETROIT at **5:40 P. M.**

11:30 A. M. (SUNDAYS EXCEPTED.) SPECIAL NEW YORK & BOSTON EXP.
Arrives at Michigan City 1:13 P.M.; New Buffalo 1:33, Niles 2:15, [Dinner], Kalamazoo 3:53 P. M.; Battle Creek 4:23, Marshall 4:48, Jackson 5:45, Detroit 7:55, London 12:05, A. M. Hamilton 2:35 A. M.; Toronto 9:20, Suspension Bridge 3:55, Rochester 7:00 A. M.; Albany, 2:00 P. M.; NEW YORK, **6:25**, BOSTON, **11:50 P. M.** ☞ This train connects at ROCHESTER (7:00 A. M.) with

Wagner's Magnificent Palace Drawing-Room Cars!

☞ RUNNING THROUGH TO NEW YORK, WITHOUT CHANGE! ☜

5:15 P. M. (DAILY.) ATLANTIC EXPRESS.
Arrives at Michigan City, 7:18 P. M.; Niles 8:30 P. M. [Supper]; Kalamazoo, 10:25 P. M.; Jackson, 1:00 A. M.; Detroit 3:40, London, 8:35, [Breakfast]; Hamilton 11:40, Suspension Bridge 1:30 P. M.; Rochester 5:00 P. M.; Albany, 1:30 A. M.; NEW YORK, **6:40 A. M.**; BOSTON, **11:00 A. M.** A MAGNIFICENT DRAWING-ROOM SLEEPING CAR is attached to this train daily, FROM CHICAGO TO NEW YORK CITY. The celebrated

☞ **Hotel Drawing-Room Car is also attached to this Train from Chicago to Rochester!** ☜

☞ These, together with **ELEGANT DAY CARS TO SUSPENSION BRIDGE,** make this Train the favorite Train for all points East.

SPECIAL NOTICE.—Boston and New England Passengers will please notice that this Train now makes direct connection through. A SLEEPING CAR is attached at Rochester at 5.20 P. M., running through to Springfield, Mass., thus avoiding transfer at Albany. Breakfast at Springfield. This Train reaches Springfield early enough second morning to **Connect with all Trains** up and down the Connecticut.

9:00 P. M. (SAT. & SUN. EXCEPTED). NIGHT EXPRESS.
Arrives at Michigan City, 11:03 P. M.; Niles, 12:25 A. M.; Kalamazoo, 2:00; Marshall, 3:12; Jackson, 4:25; Grand Trunk Junction, 7:00; Detroit, 7:30; London, 1:45 P. M.; Hamilton, 4:35; Toronto, 9:35; Niagara Falls, 6:15; Buffalo, 7:15 P. M.; Rochester, 9:10; Syracuse, 12:25 A. M.; Rome, 1:55; Utica, 2:35; Albany, 6:30 A. M.; NEW YORK, **10:00 A. M.**; BOSTON, **3:40 P. M.**

PULLMAN'S PALACE SLEEPING CARS ARE ATTACHED TO THIS TRAIN FROM CHICAGO TO DETROIT,
And from Suspension Bridge to New York.

WE INVITE THE ATTENTION OF THE TRAVELER to the SPLENDID EQUIPMENTS of this FIRST-CLASS LINE TO THE EAST!

☞ FOR THROUGH TICKETS, and any and all information, Sleeping Car accommodations, &c., apply at General Office in Tremont House Block, at office in Great Central Depot; also at No. 60 Clark street, under Sherman House; at Grand Trunk Railway Office, 48 Clark street, or at New York Central Railroad Office, No. 53 Clark street, and at office under Briggs House.

H. E. SARGENT, Gen. Supt. M. C. R. R. W. K. MUIR, Gen. Supt. Gt. Western R. W. HENRY C. WENTWORTH, Gen. Pass. Agt.

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THROUGH LINE!
—VIA—
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THE ONLY ROUTE TO

TO LOUISVILLE, WITHOUT CHANGE OF CARS.

TWO EXPRESS TRAINS Leave Chicago Depot, Foot of Lake as Follows:

9:00 A. M. (EXCEPT SUNDAY.) MORNING EXPRESS.
Arriving at LaFayette, 2:25 P. M.; Indianapolis, 6:00 P. M.; Louisville, 11:30 P. M.

4:30 P. M. (EXCEPT SATURDAY.) AFTERNOON EXPRESS.
Arriving at Michigan City 6:20 P. M. [Supper]; LaFayette, 11:30 P. M. Indianapolis, 2:15 A. M.; Louisville, 7:00 A. M.; Nashville, 4.00 P. M.

A GOOD SLEEPING CAR is Attached to this Train Every Night,
And goes from Chicago to Louisville WITHOUT CHANGE!

☞ **SPECIAL NOTICE.**—This Train stops at Michigan City for Supper, and waits at that point for Michigan Central Atlantic Express East, leaving Chicago at 4:45 p. m. Passengers going South, and wishing as much time in Chicago as possible, can take the 4:45 p. m. Michigan Central Atlantic Express, and connect without fail at Michigan City, with above Through Louisville Express.

☞ **THE GREAT BRIDGE ACROSS THE OHIO** at Louisville being completed, passengers are relieved of the omnibus transfer.

FOR THROUGH TICKETS, via this line, apply at offices of connecting lines and at all Ticket offices in Chicago.

HENRY C. WENTWORTH, Gen. Pass. Agent.

Michigan Central R. R.
LOCAL CONNECTIONS:

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Open from New Buffalo to St. Joseph, Mich.
5:00 A. M. AND **4:30** P. M. Trains from Chicago Connect at New Buffalo.

Kalamazoo, Allegan & Grand Rapids R. R.
Open to Grand Rapids.
11:30 A. M. AND **9:00** P. M. Trains from Chicago Connect at Kalamazoo.

Peninsular Railroad of Michigan.
Open to Charlotte.
5:00 A. M. AND **9:00** P. M. Trains from Chicago Connect at Battle Creek.

Jackson, Lansing & Saginaw Railroad.
Open to Bay City, Mich. Passing through Lansing and Saginaw.
5:00 A. M. AND **9:00** P. M. Trains from Chicago Connect at Jackson.

GRAND TRUNK RAILWAY.

All Michigan Central Trains Connect at Grand Trunk Junction
— FOR —
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